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Relative performance of testers to identify elite lines of corn (Zea mays L.)

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Relative performance of testers to identify

elite lines of corn (Zea mays L.)

by

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GENERAL INTRODUCTION

Corn (*Zea mays* L.) production is important in the world market because of the different uses given to this cereal. In general, Human consumption and animal feed are the main uses of corn, but the grain is also used for several industrial products. Corn breeding has been one of the main components to maintain the world demand of this cereal during the past 40 years. Different types of cultivars have been grown by farmers based on the development of newer methodologies for corn improvement and cultural practices to maximize corn production. Open-pollinated varieties, synthetics, and hybrids have been used by farmers from different countries or crop areas depending on the specific economic situations of the crop. Generally, hybrid cultivars have exhibited greater yield potential under favorable conditions of adaptation and management. Hallauer et al. (1988) stated "hybrids have increased in yield because of their continued improvement in genetic potential to take advantage of improved cultural practices." Tolerance to higher plant density and greater resistance to lodging are good examples of some characteristics genetically improved in newer hybrids.

In any hybrid breeding program, the development and selection of elite lines that perform well per se and in cross combinations are the key factors for success. These two factors involve using efficient methods of testing to screen lines in early or late generations of inbreeding, determining the potentially useful lines, and identifying and discarding poorer lines. Different opinions and results have been reported on the most efficient method of line selection to use in hybrid development (Johnson and Hayes, 1936; Sprague and Tatum, 1942; Matzinger, 1953; Rawlings and Thompson, 1962; Allison and Curnow, 1966; Hallauer and Lopez, 1979). However, the "early testing" method proposed by Jenkins (1935) is the most accepted method because of theoretical and practical reasons. Jenkins (1934) concluded that the early testing method involved the evaluation of inbred-variety crosses (cross of each line by an open-pollinated variety) instead of testing all lines in all possible single crosses. Early testing would seem to have an advantage because early testing permits one to include more lines in the yield comparisons each season. Jenkins (1935) proposed the early testing procedure because "the inbred lines acquired their individuality as parents of topcrosses very early in the inbreeding process and remained relatively stable thereafter." The early testing methodology involves the concept of "tester": that is, a genotype by which the developed lines should be crossed to produce the testcrosses, which are evaluated to determine the general combining ability of the lines.

Matzinger (1953) suggested that the evaluation of inbred lines per se does not provide an adequate prediction of their performance in hybrid combinations. He reported that during 1920-1930 the common method to select elite lines was to test the n(n-1)/2 possible combinations from a set of "n" lines. This approach, however, becomes almost impossible because the number of crosses increases dramatically as the number of lines increases. This limitation led the introduction of the testcross methodology for the preliminary evaluation of new lines. Lonnquist and Lindsey (1964) considered that the success of selection in a hybrid breeding program depends both on the test procedure used and a tester that provides the greatest possible range among the different genotypes evaluated. Hallauer (1975) considered that, although the topcross test became an accepted method for the preliminary evaluation of inbred lines since it was proposed in 1927 by Davis (1927), the proper choice of tester still is an important problem for breeders. On the matter of choice of tester, Hallauer (1975) stated that there are several features the breeders usually consider in describing the best tester such as genetic base, gene frequency, combining ability, yield performance, and number of testers.

The early testing procedure assumes that the combining ability of a genotype may be determined in its early state of line development and will remain relatively the same in the following generations of selfing and selection (Hallauer et al., 1988). Russell and Teich (1967) proposed that when using an open-pollinated variety as tester, the additive gene effects were of greater relative importance than nonadditive gene effects due to the greater genetic variability of the gametes involved in the tester. Matzinger (1953) reported that the desirable small line x tester interaction to determine general combining ability was observed with use of an heterogeneous tester than with use of narrow genetic-base tester. Hallauer and Lopez (1979) compared different testers and concluded that the best tester was the one with lower frequency of favorable alleles for the traits under selection. However, they found that an unrelated elite-line tester was as effective in discriminating among lines as the poorer-performance tester. Hallauer and Lopez (1979) concluded that if single-cross hybrids are the ultimate goal, "an unrelated elite-line tester that is useful in hybrids would be the appropriate choice."

Hallauer and Lopez (1979) and Smith (1986) reported that the correlation coefficients (r) for yield between the lines per se and their testcrosses were not significant. The poor correlations supports the importance of extensive testing for the hybrid crosses because the yield of lines per-se was not considered a good predictor of the lines in hybrid combinations. El-Lakany and Russell (1971) reported that the efficiency of visual selection among and within inbred progenies to identify better lines than a random sample of lines for hybrid yield expression will depend upon the relationship of inbred plant and ear characters with grain yield of hybrid combinations. Genter (1963) assumed that lines that performed relatively good in crosses must have either a larger number of superior genes or have major genes for the desired characteristics under selection.

Developing superior lines is not just a matter of selfing but also of germplasm improvement. Rodriguez and Hallauer (1988) emphasized that if recurrent selection methods are effective to improve the traits under consideration, the breeder can expect better chances for selecting superior lines from the improved population than from the original source population. Hallauer (1991) concluded that corn breeders should be able to modify or adjust the emphasis given to traits involved in selection to meet the new requirements for yield, standability, and maturity caused by environmental changes in field husbandry.

The objectives of this study were: (1) to obtain information on the importance of determining the most adequate tester for screening lines in a hybrid breeding program; (2) to determine the relative performance of different testers in ranking a specific set of lines from different origins; and (3) to identify the most convenient tester for screening lines by early testing (S_2 or S_3) for a hybrid breeding program in which three-way or double-cross hybrids are more commonly used.

Explanation of Dissertation Format

This dissertation is based on the Iowa State University alternate format, which includes a complete paper that will be submitted for publication in a professional journal. The contents of the dissertation include a General Introduction and Literature Review previous to the paper and a General Summary and General References after the paper. Citations from the General Introduction and Literature Review are included in the General References. This study was conducted to determine the relative performance of seven testers of corn in the ranking of a set of 21 lines of different origin. The objective of the study was to identify the most effective tester to use in a hybrid program for developing three-way or double-cross commercial hybrid cultivars. A data appendix is added at the end of the dissertation which will not be included in the published manuscript.

LITERATURE REVIEW

Corn (Zea mays L.) hybrid development began in the early 1900s, although the native Americans had bred corn for thousands of years before the European colonists arrived in the New World. Corn has responded to selection over time, and different races, varieties, and strains were developed that were adapted to different environments around the world (Hallauer et al., 1988).

Wellhausen (1978) estimated that by 1978 more than 50% of the total world area used for the growing of corn was in Latin America, Africa, and southwest Asia, but less than 25% of the grain production was obtained from those areas. According to Hallauer et al. (1988) hybrids are used by farmers in Argentina, South Africa, and parts of Brazil, but open-pollinated varieties, improved synthetics, variety crosses, and hybrids are the more popular cultivars in the remaining areas. They reported that corn yield increased in the United States from approximately 1.3 Mg ha^{-1} in 1930 to 7.5 Mg ha^{-1} in 1985 because of the use of hybrids, and greater use of fertilizers and herbicides, higher plant densities, and other improved cultural practices. Carlone and Russell (1987), based in studies conducted by other researchers, reported that the estimated genetic contribution to yield improvement in the United States during the period from 1930 to 1980 ranged from 57% to 89%.

Hoegemeyer and Hallauer (1976) emphasized that "the systematic genetic advance in corn hybrids depends on the improvement of breeding populations and the efficient extraction of inbred lines." Testing lines either in early or advanced generations to identify lines for continued inbreeding to form potential hybrids is the key step for a hybrid breeding program to succeed. Hallauer and Lopez (1979), in making comparisons among testers, stated that the testing procedures to identify superior lines in hybrid combinations determine the success of any conventional hybridization program.

Sprague and Tatum (1942) suggested that single-cross diallels provide information on the general combining ability (GCA) of the lines and specific combining ability (SCA) of the parent lines for specific crosses. Both GCA and SCA are important to determine the performance of lines in hybrids. Because large numbers of lines are being tested, the use of single-diallel crosses is not practical; therefore, the breeder generally needs to determine GCA of new lines from preliminary hybrid evaluations. As Hallauer et al. (1988) stated, the development of a large number of inbred lines with desirable agronomic features is relatively easy, but the main concern is adequate testing of lines to identify superior genotypes in hybrid combinations.

Gama and Hallauer (1977), Russell and Machado (1978), Hallauer and Lopez (1979), Smith (1986), and Walters et al. (1991) conducted studies to determine the correlation between inbred lines per se performance and the testcrosses of those lines. Most of the studies reported a low correlation between lines per se and testcrosses, which means that line performance per se cannot be used for effective prediction of the performance of lines in crosses. Hallauer et al. (1988) stated that self pollination for developing inbred lines and then evaluation for hybrid performance is the main methodology used in most corn breeding programs. However, another procedure of inbred development called "early testing" begins evaluation for hybrid performance in early generations of selfing; for instance, testcrosses of the S_0 plants or S_1 lines. S_0 and S_1 genotypes that have above-average testcross performance are selected for continued inbreeding and selection.

"Early testing" was proposed by Jenkins (1935). He suggested that the hybrid combining ability of inbred lines could be determined in the very early stages of inbreeding of the lines. Jenkins stated that "the differences between lines will in a large measure be those which exist in the plants from which the lines are started." Johnson and Hayes (1936) emphasized that combining ability of inbred lines is a heritable character. Sprague (1946) reported that early testing is based on two assumptions: (1) marked differences in combining ability among open-pollinated plants are expected, and (2) a large proportion of superior lines are expected to be developed from a selected sample of lines based on tests of combining ability than from a random sample of lines based only on visual selection. Jenkins and Brunson (1932), from their research for different methods of testing lines, concluded that instead of systematic evaluation of lines in a series of paired crosses to identify superior lines, the crosses of the lines with an open-pollinated variety could be more efficient in the preliminary evaluation of new lines. This suggests that during the early use of the topcross concept, breeders usually included a genetically broad-base tester. Because of the greater heterogeneity of broad-base testers, the only objective of the topcross is to obtain an initial measure of the combining ability of the lines (Hallauer and Lopez, 1979).

Hallauer et al. (1988) emphasized that the main objective of using the early testing procedure is to identify those inbreds that are good enough to continue in subsequent inbreeding generations and discard those with poor combining ability. Most breeders, however, probably use an intermediate stage of testing. Instead of hybrid performance evaluation of S_0 or S_1 lines, testing usually is done at either the S_2 or the S_3 generation. Clucas and Hallauer (1986) evaluated whether visual selection of lines can be effective in choosing superior lines with good combining ability. They found that even though there were significant differences for grain yield between the visually selected and the unselected S_1 lines per se, there were no differences between the testcross means of the two groups of lines. Based on their results, they suggested that visual selection should not be used for selection of the superior genotypes, but visual selection should be used to discard undesirable genotypes before evaluation in testcrosses. Therefore, visual selection was recommended to emphasize selection for disease and pest resistance and eliminating those genotypes that have gross morphological defects. Visual selection is not used to identify lines that are potentially superior in single-cross hybrids (Gama and Hallauer, 1977).

The choice of tester by breeders for either early or late testing should be based on the stage of development of every breeding program; genotypes to be tested, alternative testers available, and the type of hybrids expected to be produced with the materials under selection (Hallauer et al., 1988). Hallauer (1975) suggested that corn breeders usually include several alternatives when selecting a tester, such as broad genetic base vs. narrow genetic base, high gene frequency vs. low gene frequency, general combining ability vs. specific combining ability, high yield vs. low yield, and several testers vs. one tester. The concept of early testing involves a progeny test. The progeny test was defined by Allard (1960) as "a test of the value of a genotype based on the performance of its offspring produced in some definite system of mating."

Definitions about the features of either the best tester or the most convenient tester have been suggested. Rawlings and Thompson (1962) defined a "good" tester as the one which discriminates efficiently among the materials under test with the least amount of testing. Allison and Curnow (1966) defined the best tester as the one that maximizes the expected mean yield of the population produced from random mating of selected genotypes. Matzinger (1953) defined a desirable tester as the one which combines the greatest simplicity in use with the maximum information on the performance to be expected from the tested lines when they are either used in other combinations or grown in other environments. Matzinger (1953) stated that no single tester could fit accurately these requirements. Russell (1961) stated that an ideal tester parent is one which expresses the greater genetic differences among testcrosses. However, it is important that this information can be used in prediction of the performance of the lines either in different combinations or evaluated in different environments. Hallauer (1975) concluded that a suitable tester "should include simplicity in use, provides information on the correct ranking of the relative merit of the lines under test, and maximizes genetic gain."

The main objectives for evaluation of testcrosses in a corn breeding program are (1) to determine breeding values of genotypes for population improvement and (2) to determine the combining ability of inbred lines in a hybrid development program (Hallauer and Miranda, 1988). Sprague and Tatum (1942) proposed that relative information about general and specific combining ability of lines is desirable regardless the stage of inbreeding at the beginning of the testing program. They defined general combining ability (GCA) "as the average performance of a line in hybrid combinations," and specific combining ability (SCA) "as those crosses in which certain combinations do relatively better or worse than would be expected on the basis of the average performance of the lines involved." They suggested that GCA effects could be interpreted to mean the genes involved have largely additive effects, and that SCA effects indicate that the genes show dominance and epistatic effects. Kempthorne and Curnow (1961) emphasized that "general combining ability is not a fixed property of a line alone but a property of the line relative to the genetic composition of the population of lines to which it has been crossed;" that is, those lines included in the diallel crosses. Quantitative genetic theory about gene action and gene frequency provides information on the most effective tester expected in the development and selection of inbred lines for hybrids (Hallauer, 1975).

Sprague et al. (1959) concluded from a study designed to obtain information about the type of gene action involved in heterosis in corn that for the material they evaluated, partial and complete dominance gave the best explanation of the results. Moll and Stuber (1974) considered that the main component of the total genetic variance in a population is due to additive genetic variance (or general combining ability), while the nonadditive genetic variance (or specific combining ability) usually is considered small, with the level of dominance in the partial to complete dominant range.

If dominance is not present, any tester will give a similar measure of genetic variation among testcrosses (Hallauer et al., 1988). However, the advantage of using a tester with low allele frequency is greater as the level of dominance increases. Allison and Curnow (1966) agreed with the concept of using a tester with a low allele frequency, but they added that with partial to complete positive dominance ($d > 0$), the best tester would be homozygous recessive. They also stated that the probability of having complete homozygosity for all recessive loci in an inbred line is very small. The more effective tester would be an inbred homozygous recessive for the more important loci under selection or a variety with low allele frequency at the most important loci. Rawlings and Thompson (1962) concluded that based on genetic theory the best tester is one that has low favorable allele frequency for the agronomic traits of interest in the materials involved in evaluation. They added that it has been generally accepted that evaluation of general combining ability in inbred lines is more efficient when a broad genetic-base tester is used rather than a narrow genetic-base tester. Matzinger (1953) proposed that the choice of tester will be determined by the objective that the breeder has for the set of lines under study.

For single testcrosses involving previously selected lines, genes conditioning specific combining ability have greater effects on the determination of yield differences. Genes affecting general combining ability, however, are more important for unselected lines (Sprague and Tatum, 1942). Rawlings and Thompson (1962) stated that a lower frequency of favorable alleles present in a tester allows the expression of those favorable alleles present in the lines under selection, even in the presence of dominant gene effects. El-Lakany and Russell (1971) reported that tests for general combining ability can begin as early as the first segregating generation, but tests for specific combining ability should be delayed until the fourth or fifth generation of selfing. Green (1948), in his study on the inheritance of combining ability in corn hybrids, reported that the occurrence of high-combining segregates was more frequent from progenies of crosses of higher combining-inbreds than from crosses involving either high- by low- or low- by low-combining inbred parents. Penny et al. (1962) conducted a study to obtain information on the type of gene action involved in yield heterosis in corn. They concluded that the predominant kind of selection obtained seemed to have been for genes showing complete or partial dominance with largely additive effects.

Horner et al. (1976) concluded, based on their research evaluating two different testers, that either overdominance or epistasis, or both, seem to be of importance in yield heterosis. Therefore, breeders should be able to change testers according to their objectives without fear of significant loss due to specific combining ability built up at considerable expense over the years in the selected populations. Lonnquist and Lindsey (1964) concluded from their research that use of a broad genetic-base unrelated tester permitted some selection for heterotic (overdominance) effects, while S_1 progeny seemed to emphasize selection only for additive effects. They also stated that if overdominance is important for some loci, the recommended alternative would be to use testcrosses to capitalize on selection of dominant favorable alleles when such effects are not selected efficiently using inbred evaluation. Han et al. (1989) conducted a theoretical study to explore the quantitative relationship between inbred lines per se and their crosses. They found a nonlinear relationship which could be interpreted if the expected genotypic values of a hybrid depend on the means of favorable genes present in the inbreds involved, the difference between the two inbreds, and the level of dominance and additive gene effects.

Heterosis depends on the presence of differences in the allele frequencies and dominance effects between the parents of a cross (Falconer, 1981). Walters et al. (1991) recommended that it is important for the breeder to know how the changes in performance and genetic variability due to improvement in populations can affect the relationship between parental lines and hybrid combinations. They considered that such a relationship probably is determined mainly by the relative importance of additive and nonadditive genetic effects and changes in allele frequencies. Getschman and Hallauer (1991) concluded that the amount of genetic variation present is very important to have effective discrimination among and within inbred and testcross progenies. Smith (1986) concluded that the use of testcrosses permits one to identify those lines with a greater frequency of favorable alleles if those alleles are in low frequency (or absent) in the tester. Hull, cited by Rawlings and Thompson (1962) and Hallauer and Lopez (1979), stated that "the most efficient tester would be one that is homozygous recessive at all loci and that homozygosity for dominance alleles at any locus should be avoided."

Sprague and Tatum (1942) reported, that for the previously selected lines involved in their study, specific combining ability was more important than general combining ability in yield performance. They also concluded that with unselected lines, additive effects were more important than epistasis and dominant effects. They emphasized that the variance estimates of general and specific combining ability are relative; hence, they are specific for the group of lines involved in the crosses under test. Interpretation of those estimates allows one to make inferences about the type of gene action that was more important in the expression of a trait for the lines involved.

Developing lines is not a difficult task, but, as was stated by Shull and cited by Hallauer et al. (1988), "the object of the corn breeder should not be to find the best pure line, but to find and maintain the best hybrid combination." The most important step of applied corn hybrid breeding is the effective evaluation of lines as crosses because the real value of inbred lines is their use in hybrids (Getschman and Hallauer, 1991). Bauman (1981) reported that a survey of corn breeders in the United States showed that 89% of them use an inbred line as a tester, while only 11% use a single-cross tester. This survey could be biased because in most instances single crosses are used as commercial hybrids in the United States and in many other corn production areas around the world. Russell (1969) found that line selection by early testing was effective when using testcrosses with the tester used in the development of the lines. However, the gain was not evident if a different tester was used for the evaluation of testcrosses.

LeFord and Russell (1985) conducted a study to investigate methods for the improvement of physical grain quality. They used a set of S_2 lines from a population and evaluated testcrosses with B73 and Mo17 lines as testers. The results showed a significant line-by-tester interaction for all the traits under study which was inferred as due to the presence of nonadditive gene action. They found that grain-breakage susceptibility and yield were greater for B73 testcrosses than for Mo17 testcrosses; however, they suggested that any relationship between the two traits based on testcrosses means could be due to the confounding effects of testers. Abel and Pollak (1991) reported the difficulty deciding which tester gives an accurate ranking of testcrosses. They considered that perhaps comparing the ranking of each tester with the ranking mean across all testers was an effective way to decide which tester provided a better ranking of the testcrosses.

The low and inconsistent correlations obtained for the relationship between inbred and hybrid traits in corn suggested that the differences among correlations could be due to sample size, population sampled, types of crosses evaluated, and the environments in which the inbreds and testcrosses were grown (Gama and Hallauer, 1977). Rissi and Hallauer (1991) concluded that the greater tester-by-line interaction was not because a narrow genetic-based tester was used rather than the use of broad genetic-base tester. They also concluded that more consistent discrimination among S_2 lines was obtained when the parental population was used as tester. Horner et al. (1976) emphasized that, although a homozygous line was considered to be a better tester, if the level of overdominance is an important factor, and if the lines under selection are expected to be used in hybrids other than single crosses, then an established single-cross tester that is considered a good seed parent could be recommended because the products from selection would be more easily used in commercial production.

Russell and Teich (1967) reported research on a comparison of lines selected under low and high population density and by either visual selection or testcross selection. They found that lines selected at either a lower or a higher plant density resulted in lines with similar performance to population levels. Moreover, they found that lines selected on their visual performance in high density were at least as effective as selection by extensive testcross evaluation, and more efficient. Hallauer et al. (1988) emphasized that further increases in corn yields may be expected mainly from the combined improvement of two factors: (1) management and agronomic practices, and (2) genetic potential of the hybrids. Carlone and Russell (1987) evaluated different cultivars at different cultural practices and concluded that each cultivar seemed to achieve its maximum yield at a unique plant-nitrogen level combination. They also concluded that significant densities x nitrogen levels interactions for grain yield suggested that both treatments affected each other. Consequently, the effects of these treatments should not be interpreted independently (e.g., higher plant density required the use of more N fertilizer). Hallauer (1975) concluded that "effective selection for disease and insect resistance and for agronomic traits in combination with the inbred tester should enhance the development of new superior lines that are useful in combination with other elite lines." Genter (1963) recommended that a program for developing hybrids must be concerned with the development of inbred lines with the simultaneous selection for many traits which determine the net worth of the lines; accurate screening of inbreds for yield is possible only by testing them directly per-se. The weaknesses of inbred lines themselves would be more likely identified because there is no chance of masking from the tester any weakness involved in the line.

Russell (1961) conducted a study to evaluate the most efficient type of tester to screen for resistance to corn stalk rot (Diplodia zeae Schw.) He found that the estimates of the testcross variance component showed a decreasing trend for inbred, single-cross, and double-cross testers. Russell also suggested that this trend of variability among testcrosses agrees with genetic expectations because an inbred tester estimates specific effects, a double-cross tester estimates average effects, and a single-cross tester is considered to be intermediate to the single-cross and double-cross testers. Getschman and Hallauer (1991) reported that better discrimination among testcrosses could have been made using inbred lines as testers instead of using single crosses as testers. Hallauer (1975) emphasized that in early testing programs the expression of greater variation among testcrosses would permit a greater range of discrimination when selecting lines to continue inbreeding. Horner et al. (1976) suggested that with the use of an inbred tester we can expect the variability among testcrosses to be twice as large as for the broad genetic-base population tester. Hallauer (1975) mentioned that with use of an inbred tester we also can expect to select lines which have higher GCA in crosses with other elite lines. Smith (1986) reported that results of computer simulation studies and empirical studies agree that the use of high performance (good) testers could reduce the genetic variance among testcrosses and the correlation between line per-se and testcross performance.

Sprague and Tatum (1942) recommended that the material chosen as a tester parent should have a broad genetic-base diversity to ensure that the differences in yield result primarily from differences in general combining ability. Jenkins (1935) reported that the measure of combining ability obtained from a topcross test is relatively stable and does not change during the process of inbreeding and selection. Sprague (1946) suggested that in those instances in which the germplasm has low allele frequency conditioning desirable characteristics or when such characteristics can be easily evaluated visually, early testing would be of limited value in the early stages of a breeding program. Hallauer and Miranda (1988) stated that the main difference between general vs. specific combining ability is due to whether a broad- or a narrow-genetic base tester is used; that is, genetic base of tester is the key because of the genetic variability within the tester per se. They expressed concern that the best tester to evaluate combining ability of lines might be for either early or late testing methods. Johnson and Hayes (1936) reported that better single crosses are expected from inbred lines that have higher yields in testcrosses.

Matzinger (1953) reported that the variance component for the line-tester interaction decreased as the heterogeneity of the tester increased. Hallauer and Miranda (1988) suggested that, if the interest is on general combining ability of lines, a broad genetic-base heterogeneous population is recommended as tester (e.g., parental population, synthetic, or open-pollinated variety). For this situation, the genotypes under evaluation are tested with a representative sample of genotypes from the tester genome. If a narrow genetic-base tester is used (inbred line or single cross), information about specific combining ability is obtained. Rawlings and Thompson (1962) evaluated testcrosses from which information from previous studies was available. They concluded that the most efficient testers were those in which a low frequency of favorable alleles at important loci was assumed, which supported the theory for poorer performing testers. Hallauer and Lopez (1979) conducted a comprehensive study to make comparisons among different types of testers for selecting lines of corn. They found that the best tester, based on the variability expressed among the testcrosses, was a poor-performing related line. This finding agrees with the genetic theory that the best tester will be one that has a low frequency of favorable alleles for the traits under selection. On the other hand, they found that an unrelated elite-line tester was as effective in discriminating among lines as the poor-performance related line tester. They emphasized that although the theory suggested a poor tester as the best tester, the final choice of tester for an applied breeding program should be based on the use expected for the lines under test. Therefore, the use of a poor-performance line as a tester would not be practical in most breeding programs. Based on those findings, they concluded that "an unrelated elite-line tester that is useful in hybrids, therefore, would be the appropriate choice."

Genter (1963) reported three different methods available for early generation evaluation among segregating plants: evaluation based on individual plant performance, on testcross performance, and on progeny performance. He mentioned that a combination of the three methods could be used. Successful selection based on individual plant performance could be obtained for traits that are little affected by environment, such as oil content evaluated under carefully controlled environments. Genter and Alexander (1962) compared performance of S_1 progenies and testcrosses of corn and concluded that less environmental effect was exhibited by the S_1 progeny performance than the testcross performance. They also concluded that if heterosis was mainly due to additive effects of dominant genes, as is generally accepted, progeny performance of early generation inbred lines should estimate their general combining abilities more efficiently than testcrosses performance.

El-Lakany and Russell (1971) stated that most breeders impose visual selection for highly heritable traits among and within progenies in the early generations of inbreeding because evaluation often restricts the number of selections that can be tested. After visual selection in the early generations of inbreeding, hybrid yield performance is determined after most undesirable selections have been eliminated. Clucas and Hallauer (1986) indicated there is a relationship between visual selection and late maturity in corn, which could be explained because the later-maturing genotypes usually have better stay green (plant health) in comparison with earlier genotypes; therefore, the later maturity genotypes can be more attractive phenotypically for selection.

Russell and Machado (1978) evaluated visual selection, early testing, and plant density to develop inbred lines, and concluded that visual selection and early testing were similarly effective for selecting superior lines. Jenkins (1935), in his study involving visual selection and early testing, concluded that "the inbred lines acquired their individuality as parents of topcrosses very early in the inbreeding process and remained relatively stable thereafter." This conclusion supported the theory of early testing to identify those lines to continue for further selection and inbreeding.

Lonnquist and Lindsey (1964) compared S_1 line performance per se with topcross performance and found that the yield of the three highest yielding S_1 lines was 59.5 bushels per acre (37.2 q/ha) when tested as topcrosses, and the yield of the three highest yielding topcross-selected lines was 66.9 bushels per acre (41.8 q/ha). Lonnquist (1968) found that the newly derived population based on S_1's testcrossed to the parental population as tester showed a 15% increase in yield relative to the original population, while line per se selection evaluated in testcrosses had only a 4% gain in yield. The population derived from S_1 testcrosses with an unrelated tester did not show any gain. Lonnquist (1968) concluded that use of an unrelated tester to select S_1 lines would result in selection based upon confounding nonadditive genetic effects because of genetic diversity. Gama and Hallauer (1977) found very small simple and multiple correlations for plant and ear traits of inbred lines and single-cross hybrids. Therefore, as has been concluded by other researchers, the traits of inbred lines are not good predictors for their performance in hybrid combinations, which seems to indicate that testing of lines in crosses is the only effective way to identify superior lines in crosses. Smith (1986) reported that the low correlations between lines per se and testcross performance generally found may.indicate that the performance of the testcrosses was affected by large amounts of nonadditive gene action. Hallauer et al. (1988) reported that, for single-cross hybrids, yield testing of the lines per-se along with the hybrid crosses is justified because of the importance of involving vigorous parental lines for hybrid seed production. The evaluation of the lines could be limited to an observation row in the breeding nursery for two or three years while the hybrid crosses are under extensive evaluation in several location-year trials.

Hallauer and Lopez (1979) found that the correlation between S_1 testcrosses and S_8 testcrosses was low. That could be undesirable if early testing is recommended to identify superior lines to continue inbreeding. However, they observed that even with the low correlation obtained, the highest yielding S_1 testcrosses were usually the highest-yielding S_8 testcrosses. Therefore, they concluded it is important to remember that the original objectives of early testing was to identify those lines which are relatively good and relatively poor in testcrosses. The objective of early testing seems valid to continue selection only in those progenies that have above-average combining ability.

Keller (1949) made a comparison of number of testers needed to evaluate inbred lines of corn and concluded that the differences of the testers in ranking the lines suggested the possibility of using more than one tester to increase efficiency of evaluating lines in crosses. He also concluded that any decision was limited to the lines involved in the test, and that the selection of a tester depends upon the use expected for the lines under test. Hallauer (1975) stated that if there is no dominance, we can expect an equal measure of genetic variance among testers. But, as the level of dominance increased, the use of a tester with lower allele frequency was considered an obvious advantage. Keller (1949) emphasized that the use of two or more testers in evaluating a number of inbred lines allows comparisons of (1) the ability of the testers involved to rank the lines similarly and (2) the variances among the testcrosses for each tester.

The concepts of combining ability, early testing, and testers are not only involved with line development and hybrid production, but they are important considerations with population improvement either for developing open-pollination varieties or lines to be used in hybrids. Loeffel (1971) considered that a program for developing vigorous parental lines should include: (1) improvement of germplasm source (e.g., by recurrent selection); (2) methods to permit recombination within narrow-genetic base germplasm to reduce the rate of approaching homozygosity for continued selection, and (3) improved procedures and methodologies to assist in making effective selections (sampling, testing, etc.). Hallauer and Miranda (1988), based on experimental evidence, summarized that either an inbred line homozygous recessive or a population with low allele frequency at important loci will be the most effective tester to use in a hybrid breeding program or in recurrent selection for population improvement. Cress (1966) reported that to emphasize gain from selection for a heterogeneous population the choice of a tester is often based on the average performance of the testcrosses, so that, when the selected individuals are to be used immediately in hybrid combinations with the tester, the tester chosen could be the one with the highest average cross performance; otherwise, this emphasis on heterotic response would not be in the right direction.

Rodriguez and Hallauer (1988) reported that recurrent selection methods were proposed to increase the frequency of favorable alleles for the traits under consideration. The final use expected from the products obtained from recurrent selection is to provide better germplasm sources for applied breeding projects. Eyherabide and Hallauer (1991) considered that, for crop species in which hybrid production is commercially possible, the use of reciprocal recurrent selection methodology could be a useful tool for improving germplasm for deriving superior lines. Hoegemeyer and Hallauer (1976) reported research on selection among and within full-sib families to develop single-crosses of corn. They concluded that the significant, positive SCA effects showed in some crosses must result from selection and fixation of genes in opposite lines, which resulted from selection for dominance or epistatic effects. Therefore, they concluded that full-sib recurrent selection should be an effective method to accumulate favorable alleles as well as increasing heterosis between two populations. That means that the lines isolated would be superior for SCA and GCA.

Allison and Curnow (1966) studied the choice of tester for breeding synthetic varieties of corn and suggested that the estimates of allele frequency and the amount and direction of dominance will not be generally known. They concluded that in theory the recessive homozygote is the best tester for maximizing the mean yield expected in a synthetic variety. Walters et al. (1991) reported that, in theory as a result of population improvement by recurrent selection, the frequency of deleterious alleles was decreased while the frequency of favorable alleles was increased. Therefore, the breeder can expect from selfing an improved cycle that fewer deleterious alleles are expressed in the lines developed for a given quantitative trait. Clucas and Hallauer (1986) indicated that corn breeders test a large number of progenies in yield trials for population improvement, and recurrent selection emphasizes early testing for hybrid selection. They believed that, because of resources needed to conduct those trials, any previous selection or preliminary screening for pests would be beneficial. They suggested intrapopulation recurrent selection schemes using either S_2

lines per se or S_1 testcrosses as good alternatives that would involve visual selection and yield testing for selection of superior genotypes.

Horner et al. (1976) compared three different methods for conducting recurrent selection: (1) use of an inbred tester, (2) use of a broad-base parental population, and (3) yield of S_2 lines per se. With the three methods, a significant linear increase in general combining ability was obtained, but the inbred tester method was the one which showed greater efficiency (4.4% gain per cycle) in comparison with 2.4% per cycle for parental tester and 2.0% per cycle for S_2 lines per se. They concluded that the inbred tester was more efficient because it was homozygous recessive at many important loci, which resulted in a larger testcrosses variance and more efficient selection of dominant favorable alleles in comparison with the parental tester. Sprague (1946) presented data which showed that individual plants in a synthetic variety differed markedly in combining ability, and that the same would be expected from an open-pollinated variety or from advanced generations of a hybrid.

Lamkey and Hallauer (1987) reported the estimates of heritability from different recurrent selection experiments in corn. Testcross selection involving S_1 plants crossed to a broad-genetic base tester provided greater interpopulation improvement. Lonnquist and Gardner (1961) emphasized that greater success is expected when deriving inbred lines from populations that have a higher frequency of more favorable alleles and that express considerable heterosis in crosses. This can be best expected in conducting a reciprocal recurrent selection program followed by inbreeding in the derived populations. One of the main reasons for the expected results is because the two populations involved are the tester for each other. Darrah et al. (1972) conducted a study in Kenya to compare the efficiency of different methods in corn breeding. Darrah et al. (1972) found a 10% gain per cycle in two populations involved in reciprocal recurrent selection. These results were significantly greater than experiments conducted in the United States at that time. They found a rapid improvement not only in the variety cross, but also in the varieties and topcross commercial hybrids developed from the program of recurrent selection. Comstock (1979) found that use of the involved populations as testers for each other in reciprocal recurrent selection was more appropriate theoretically than using pure-line testers. Comstock's (1979) conclusion was in contrast with some suggestions that the proposed use of inbred lines as tester will increase genetic variance among test progenies, which is considered a desirable feature to obtain effective selection (Russell and Eberhart, 1975).

Hallauer (1990) emphasized that the basic element of any breeding program is the choice of germplasm. The specific breeding goals and the experience of the breeder usually influence the choice of germplasm. He stated that the problem for breeders has not been the availability of genetic variability within a germplasm source, but the choice of germplasm which achieves the breeding objectives. He emphasized that most of the corn germplasm accessions available are not of direct value themselves for modern corn breeding efforts, but only after some genetic improvement to contribute to modern corn breeding programs. Paterniani (1990) suggested that once a population was improved by any method of recurrent selection, inbreeding can result in expected superior genotypes because the genetic composition of inbred lines is directly related with the frequency of alleles in the source population. Abel and Pollak (1991) conducted a study to evaluate different accessions of unadapted germplasm using eight different testers. They found differences in ranking among testers and for the accessions per se for grain yield. Therefore, they concluded that more than one tester should be used to screen unadapted germplasm accessions. In their research, they found that testers from the same heterotic group ranked inconsistently the different accessions. Penny et al. (1962) stated that, in comparing genetic diversity from different sources, we would expect more diversity in an open-pollinated variety than in a population derived from the cross of two homozygous inbred lines. Therefore, if other factors are similar, the more effective selection would be in an open-pollinated variety than in a less variable population.

SECTION I: RELATIVE PERFORMANCE OF TESTERS TO IDENTIFY ELITE LINES OF CORN (*ZEA MAYS* L.)

ABSTRACT

Testcross evaluation is an accepted method to determine relative potential of corn (*Zea mays* L.) lines in a hybrid breeding program. Choice of tester is the critical element for efficient selection among lines for their potential in hybrids. Testcrosses among 21 lines and seven testers were evaluated at seven environments in Guatemala. The experimental design used was a randomized complete block with a split-plot arrangement, where lines were assigned to whole-plots and testers to sub-plots. The objectives of this study were to obtain information for choice of testers and identify the more convenient tester to use primarily in early testing for a hybrid program in which three-way and double-cross hybrids are commonly used. Yield and agronomic traits were recorded, but the combined analysis for yield (t/ha) was the main trait of interest.

Highly significant differences ($P \leq 0.01$) among lines and testers indicated differences across environments. Highly significant differences for the testers by lines interaction indicated that the different testers ranked the lines differently. Highly significant coefficient of concordance (W) and Pearson correlations (r) suggested that the ranking of lines across testers was relatively consistent. Testcrosses with tester No. 5, a single cross, had the greatest average yield (6.481 t/ha). Based on the variance among testcrosses, estimate of general combining ability, correlation with the other testers, and acceptable performance per se, tester No. 4 was considered a good compromise as choice of tester for the hybrid breeding program in Guatemala. Lines with good general combining ability that can be involved in different hybrid combinations for extensive evaluation were identified. Three-way testcrosses superior to the best check (ICTA HB-85) were identified for further evaluation as potential new hybrids for release. Significant correlations between yield and diseases

(*Puccinia polysora* Underw and *Exserohilium turcicum* Pass. = *Helminthosporium turcicum* Pass.) reflected the importance of emphasizing selection for diseases during the line development process.

Index words: *Zea mays* L., Corn, Maize, Testers, Testcrosses, Combining ability.

INTRODUCTION

Corn (Zea mays L.) hybrid development has been an important factor in meeting the increasing world demand of this cereal during the past 30 years. Although there are countries in which corn hybrids are not the main cultivars used, national and private breeding programs are providing budgets for the development of hybrids as an alternative to increase corn production either for domestic consumption or for trading in the world market.

Developing and testing lines at either early or late generations of inbreeding are the main steps in developing corn hybrids. Gardner (1961) emphasized that the value of any selection method depends in large extent on the accuracy with which genotype evaluation may be executed. Jenkins and Brunson (1932) suggested that crosses of the lines with an open-pollinated variety would be a more efficient methodology for the preliminary evaluation of new lines, than the systematic evaluation of lines in a series of paired crosses. The "early testing" method suggested by Jenkins (1935) is an accepted method for line selection in hybrid development. He stated that "the inbred lines acquired their individuality as parents of topcrosses very early in the inbreeding process and remained relatively stable thereafter." The early testing method involves the concept of "tester", which is a genotype (inbred, single-cross, synthetic, or population) by which the lines under screening should be crossed. The testcrosses are evaluated at different environments to determine the general combining ability (GCA) of the lines under study. Sprague and Tatum (1942) defined GCA "as the average performance of a line in hybrid combinations." They suggested that GCA effects could be interpreted as if the genes have largely additive effects.

Line selection based on per-se performance or testcross performance has been extensively studied (Gama and Hallauer, 1977; Russell and Machado, 1978; Hallauer and Lopez, 1979; Smith, 1986; Walters et al., 1991). Most of these studies reported poor correlations between inbred lines per-se performance and the testcrosses of those lines. Smith (1986) proposed that testing both the lines per se and their testcrosses, and combining the results in an adequate manner, is required to identify superior lines per se and high hybrid performance. Johnson and Hayes (1936) stated that the combining ability of inbred lines is a heritable character. Hallauer et al. (1988) stated that the main objective for the early testing method is to select those genotypes that are relatively better for continued inbreeding and discard those that have relative poor combining ability.

Different studies have provided definitions of either the best or the more convenient tester (Rawlings and Thompson, 1962; Allison and Curnow, 1966; Matzinger, 1953; Hallauer, 1975). Matzinger (1953) defined a convenient tester as the one which combines simplicity in use with the maximum information about the performance expected among the lines when they are tested in other combinations or in other environments. Russell (1961) concluded that the expression of greater genetic differences among testcrosses is one of the main features of an ideal tester parent. Smith (1986) concluded that, if a tester with low frequency (or absence) of favorable alleles is used in the testcrosses, those lines with greater frequency of favorable alleles can be identified. Hallauer (1975) and Genter (1963) emphasized that elite lines in hybrid combinations should be obtained from simultaneous selection for disease and insect resistance and for agronomic traits. Hallauer and Miranda (1988) summarized that either a homozygous recessive line or a population with low allele frequency for important traits under selection would be an effective tester to use in a hybrid breeding program. Hallauer (1975) expressed that, when making the choice of tester, breeders usually involve several alternatives, such as broad genetic-base vs. narrow genetic-base, high allele frequency vs. low allele frequency, general combining ability vs. specific combining ability, high yield vs. low yield, and several testers vs. one tester.

The objectives of this study were (1) to obtain information on the importance of determining the most adequate tester for screening lines in a hybrid breeding program; (2) to determine the relative performance of different testers in ranking a specific set of lines from different origins; and (3) to identify the most convenient tester for screening lines by early testing (S_2 or S_3) for a hybrid breeding program in which three-way and double-cross hybrids are more commonly used.

MATERIALS AND METHODS

Materials

The genetic germplasm used to conduct this study is part of the germplasm bank of the Instituto de Ciencia y Tecnologia Agricolas (ICTA, Guatemala) which is the national institution in charge of agricultural research in Guatemala. The crosses to obtain the material for testing were produced in Guatemala in 1989 and the evaluation of the trials was conducted at five different locations in Guatemala during 1989-1990.

Twenty-one lines with different level of inbreeding and seven testers with tropical adaptation were crossed to produce the genetic material (147 testcrosses) for evaluation in this study. A brief description of the genetic material is as follows:

Pedigree of lines and level of inbreeding:

Line 1 = Pop. 32 (S_1)-1408

Line 2 = Pool 23 (S_1)-1409

Line 3 = Pool 23 (S_2)-1410

Line 4 = Pop. 21 (S_2)-1411

Line 5 = Pop. 21 (S_1)-1412

Line 6 = Pool 23 (S_1)-1413

Line 7 = Pool 23 (S_1)-1414

Line 8 = Pop. 32 (S_3)-1415

Line 9 = Pop. 21 (S_3)-1416

Line 10 = Pop. 22 (S_5)-1417

Line 11 = Pop. 22 (S_5)-1418

Line 12 = Pop. 22 (S_5)-1419

Line 13 = Pop. 29 (S_5)-1420

Line 14 = Pop. 29 (S_5)-1421

Line 15 = Pop. 22 (S_5)-1422

Line 16 = Pop. 29 (S_5)-1423

Line 17 = Pop. 29 (S_5)-1424

Line 18 = Achap. (S_6)-1425

Line 19 = Achap. (S_4)-1426

Line 20 = Achap. (S_3)-1427

Line 21 = Pop. 22 (S_5)-1428

<u>Pedigree of testers</u>:

Tester 1 = GB-39 x GB-37

Tester 2 = GB-39 x GB-13

Tester 3 = 43-46 x GB-12

Tester 4 = 43-46 x 43-68

Tester 5 = 43-68 x GB-13

Tester 6 = Sint. ICTA B-1

Tester 7 = GB-39

Lines 1 to 17 and line 21 were developed from different populations and pools from the Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT, located in Mexico). Lines 18 to 20 were developed from commercial materials that showed some tolerance to corn stunt (<u>Spiroplasma</u> <u>kunkelii</u>) disease. Testers 1 to 5 are single crosses of materials with different levels of inbreeding; tester 6 is a synthetic and tester 7 is an inbred.

A brief description of the populations and pools from which the lines were developed is as follows:

Population 21 (Pop. 21): Tuxpeño 1. It is adapted to tropical lowlands, and it has white dent grain, late maturity, excellent standability, and relatively short plant type. It has good performance in most tropical lowlands and is fairly tolerant to most foliar diseases. Tuxpeño 1 has good heterosis with ETO population and some U.S. inbreds. It is a good source of inbreds for tropical hybrids.

Population 22 (Pop. 22): Mezcla Tropical Blanco. It is adapted to tropical lowlands, and it has white dent and semident grain, late maturity, very broad genetic base, and good adaptation in tropical regions of Mexico, Central America, northern part of South America, East and West Africa, and India. Population 22 is a good source of superior families for production of family hybrids in Latin America.

Population 29 (Pop. 29): Tuxpeño Caribe. It is adapted to tropical lowlands, and it has white dent grain and late maturity. Population 29 has high yield potential which has been demonstrated in Mexico, Central and Latin America, Egypt, and parts of Africa and Asia. Population 29 has very wide adaptation.

Population 32 (Pop. 32): ETO Blanco. It is adapted to subtropical regions,and it has intermediate maturity, white hard flint grain type, short plant type, and excellent combining ability with Tuxpeño 1. Population 32 has been used in hybrid combination by several programs in Andean Region below 1500 m, parts of West Africa, Egypt, India, and Southeast Asia.

Pool 23 (Pool 23): Tropical Late White Flint. This population is based on white flint selections from crosses among materials from Mexico, Colombia, the Caribbean area, Guatemala, Panama and other Central American countries, India, Thailand, and the Philippines. Population 23 has late maturity, relatively short plants, and excellent yield.

Achaparramiento (Achap.): Lines derived from different commercial materials which have shown certain level of tolerance to corn stunt disease caused by <u>Spiroplasma</u> <u>kunkelii</u>.

The lines involved in the testers have as background the following: Lines GB-12 and GB-13 are S_7 lines derived from native accessions of Central America. GB-37 and GB-39 are S_3 lines derived from Population 22 and Population 29, respectively, and 43-46 and 43-68 are S_3 lines from full-sib families derived from Population 43. Population 43 is a Tuxpeño synthetic formed from 16 inbred lines. It is adapted to tropical lowlands and has white dent grains. Population 43 is tall and late in maturity and has expressed very high yield potential in the lowlands of South America, Central America, and Mexico, the humid tropics of West and Central Africa, and in parts of East Africa.

Population descriptions were extracted from CIMMYT mimeograph (1983).

The testcrosses were obtained by crossing each line to each of the seven testers. The 147 testcrosses formed the basic material for the study. Additionally, the seven testers per se were included as well as a set of seven commercial or experimental checks. The seven checks included in each evaluation trial were the following:

<u>Checks</u>:

ICTA HB-83M	AGROMER HS-3G1
ICTA HB-85	TACSA Exp.
ICTA HB-87	Dekalb Exp.
ICTA HB-83MD	

The checks identified as ICTA are hybrids from ICTA research and the other three checks are hybrids from private seed companies marketing in Guatemala. Each experiment, therefore, included 161 entries: 147 testcrosses, seven testers, and seven checks.

The 147 testcrosses were produced in 1989 under irrigation at the Cuyuta Experiment Station. To obtain the seed of each of the 147 testcrosses, a plot of each line and each tester was planted; during pollination, pollen was collected and mixed from all plants of a line and applied to at least 15 ears of each of the seven testers. Same procedure was done for each of the 21 lines involved. Crosses were identified for harvesting and a bulk of kernels from all the ears from each specific line x tester cross was obtained for evaluation.

Evaluation Trials

Seven experiments of 161 entries were conducted to obtain the experimental data for this study. The experimental design used was a randomized complete block design with a split-plot arrangement. The 23 main (whole) plots were the 21 lines plus a whole plot which included the seven testers per se and a whole plot which included the seven checks. The split plots were the seven testers. Hence, there were 21 whole plots each one with seven split plots, which gives the 147 testcrosses; additionally, a whole plot that included the seven testers per se and another whole plot that included the seven checks which complete the total of 161 entries. Each experiment had two replications.

The main (whole) experimental unit was a 14-row plot of testcrosses including each line crossed to the seven testers. For the split-plots, the experimental unit was a two-row plot. Rows were spaced 75 cm apart and hills of two plants were spaced 50 cm within rows that were 5.5 m long. Planting was made by hand sowing three seeds per hill. Plots were thinned to two plants per hill at a plant height of about 15 cm for a final stand of 22 plants (11 hills) per row. The split-plot experimental unit included a maximum of 44 plants (2 rows) in an area of 8.25 square meters (5.5 m x 0.75 m x 2), which gives a stand of 53,333 plants/ha. Fertilization, weed control, and cultural practices were used at each location according to conventional requirements and previous research experiences. All plots were hand harvested.

The evaluation trials were conducted at five locations in Guatemala during 1989 and 1990. Four experiments were planted during the rain commercial season (May-October) in 1989 at the San Jeronimo, Cuyuta, La Maquina, and Las Vegas locations. Three more experiments were conducted under irrigation conditions during 1990 at the San Jeronimo, Cuyuta, and Zacapa locations. The five locations had different climatic and environmental conditions and different climatic conditions occur at the same location in different seasons. The seven year-location combinations were designated as seven environments and they can be described as folows:

San Jeronimo-1989 (Environment-1) is at 1000 m of altitude, had 994.3 mm of rainfall and 22.3 ^{o}C of temperature; Cuyuta-1989 (Environment-2) is at 53 m of altitude, had 1294.0 mm of rainfall and 35.2 ^{o}C of temperature; La Maquina-1989 (Environment-3) is at 100 m of altitude, had 850.0 mm of rainfall and 30.0 ^{o}C of temperature; Las Vegas-1989 (Environment-4) is at 70 m of altitude, had 1815.4 mm of rainfall and 27.7 ^{o}C of

temperature; San Jeronimo-1990 (Environment-5) had 21.3 ^{O}C of temperature; Cuyuta-1990 (Environment-6) had 34.9 ^{O}C of temperature; and Zacapa-1990 (Environment-7) is at 210 m of altitude and had 26.6 ^{O}C of temperature. Environments No. 5, 6, and 7 were under irrigation conditions. Rainfall data reported are the accumulated rainfall during the growing season. The temperature data are the average of the maximum daily temperatures during the growing season of each experiment.
Data were recorded for 11 traits for each of the seven environments: yield, stand, days-to-silking, plant height, ear height, grain moisture, husk cover, root lodging, stalk lodging, prolificity, and ear rot. Also, some disease data were taken at each location depending upon their importance for each environment. The manner in which the data were taken is as follows:

Grain yield (YIELD). All the ears of each split plot were harvested and shelled by hand. The total grain was weighed in kg/plot, and a sample was taken to obtain the grain moisture content of each plot. Grain was adjusted to metric tons per hectare (t/ha) at 15.0% moisture.

Stand (STAND). The number of plants for each plot was counted just before harvesting and recorded as the number of plants that contributed to grain yield.

Days-to-silking (SILK). The number of days from planting to silking was recorded when 50% of the plants within the plot had visible silk.

Plant height (PLTH). Plant height was recorded after flowering by measuring each plot. Measurements were taken in cm from the ground level to the flag leaf collar at the base of the tassel.

Ear height (EARH). Ear height was taken in cm as an average measurement of each plot. Measurements were taken from the ground level to the node of the uppermost ear.

Grain moisture (HUM). A sample of grain of each plot was taken and percentage moisture determined with a portable moisture tester just after harvesting.

Husk cover (HUSK). The number of ears with incomplete husk cover at the ear tip was recorded. Later, this number was transformed to percentage of the total number of ears in each plot.

Root lodging (RLODG). The number of plants leaning more than 30° from the vertical was recorded one day before harvesting. The number of leaning plants was transformed to percentage of the total stand of plants in each plot.

Stalk lodging (SLODG). The number of plants broken at either ear node or below was recorded one day before harvesting. The number of broken plants was translated to percentage of the total stand of plants in each plot.

Prolificacy (PROLIF). The number of ears was recorded from each plot at harvesting and was transformed to percentage of the total stand in each plot.

Ear rot (EROT). A visual estimation of the total number of ears rotted (Fusarium moniliforme Sheld or Stenocarpella macrospora (Earle) Sutton = Diplodia maydis (Berk.) Sacc) was obtained and transformed to percentage of the total number of ears in each plot.

Disease data were taken for curvularia leaf spot (Curvularia lunnata (Walker) Boedijin), northern corn leaf blight (Exserohilium turcicum Pass. = Helminthosporium turcicum Pass.), southern corn rust (Puccinia polysora Underw), and corn stunt (Spiroplasma kunkelii) about 20 days after flowering as follows:

Curvularia (CURV). A visual score based on the severity of the disease on each plot was given on a 1 to 10 scale, with 1 being no symptoms and 10 the maximum level of disease infection.

Northern corn leaf blight (HELM and PPHELM). A visual score based on the severity of the disease on each plot was given on a 1 to 10 scale (HELM) with 1 being no symptoms and 10 the maximum level of disease infection. The relative number of plants affected was counted and expressed as percentage of the total stand (PPHELM).

Rust (RUST). A visual score based on the severity of the disease on each plot was given on a 1 to 10 scale, with 1 being no symptoms and 10 the maximum level of disease infection.

Corn stunt (VIRUS). The number of plants with symtoms was recorded from each plot and then transformed to percentage in relation with the total stand of plants in each plot.

Statistical Procedures

Data analysis

Analysis of variance (ANOVA) for yield (t/ha) was conducted for each of the seven environments, and a combined ANOVA was performed across the seven environments. For this analysis of variance only the data of the 147 testcrosses (line x tester) were included because only these entries fit the requirement of a split-plot arrangement. The 14 entries (two whole plots) that included the seven testers per se and the seven checks were analyzed separately as a randomized complete block design with two replications. The testers and checks were inçluded to provide a reference to make comparisons with the performance of the testcrosses. For the analysis of variance of the testcrosses, environments and replications were considered as random effects while lines and testers were considered as fixed effects.

The analysis of variance for each environment was performed according to the following model:

$$Y_{ijk} = \mu + R_i + L_j + (RL)_{ij} + T_k + (LT)_{jk} + e_{ijk} \quad ,$$

where

Y_{ijk} = observed value for the j^{th} line crossed to the k^{th} tester in the i^{th} replication;

i = number of replications, $i = 1, 2$;

j = number of lines, $j = 1, 2, 3, \ldots 21$ (whole plots);

k = number of testers, $k = 1, 2, 3, \ldots 7$ (split plots);

μ = overall mean;

R_i = effect of the i^{th} replication, $i = 1, 2$;

L_j = effect of the j^{th} line, $j = 1, 2, 3, \ldots 21$;

$(RL)_{ij}$ = effect of the interaction between the j^{th} line and the i^{th} replication, which is an estimate of error a;

T_k = effect of the k^{th} tester;

$(LT)_{jk}$ = effect of the interaction between the j^{th} line and the k^{th} tester; and

e_{ijk} = error b.

The format of the analysis of variance and the expected mean squares for a single environment is shown in Table 1. Based on the expected mean squares for a single location, error (b) mean square was used to test for significance of lines by testers interaction and the main effect of testers. The error (a) mean squares was used to test for significance the main effect of lines.

The analysis of variance for the experiments combined across environments was performed according with the following model:

$$Y_{ijk\ell} = \mu + E_\ell + (R/E)_{i\ell} + L_j + (LE)_{j\ell} + (LR/E)_{ij\ell} + T_k + (TE)_{k\ell} + (LT)_{jk} + (LTE)_{jk\ell} + e_{ijk\ell} ,$$

where

$Y_{ijk\ell}$ = observed value for the j^{th} line crossed to the k^{th} tester in the i^{th} replication and in the ℓ^{th} environment;

i = number of replications, $i = 1, 2$;

Table 1. Format of the analysis of variance and expected mean squares for a single environment for a randomized complete block design with a split-plot arrangement

Source of variation	df[a]	Mean squares	Expected mean squares
Replications (R)	$(r-1)$	M_6	$\sigma_b^2 + \ell/(\ell-1)t\sigma_a^2 + \ell t\sigma_r^2$
Lines (L)	$(\ell-1)$	M_5	$\sigma_b^2 + \ell/(\ell-1)t\sigma_a^2 + r\ell\Sigma L^2/(\ell-1)$
Error (a)	$(r-1)(\ell-1)$	M_4	$\sigma_b^2 + \ell/(\ell-1)t\sigma_a^2$
Testers (T)	$(t-1)$	M_3	$\sigma_b^2 + r\ell\Sigma T^2/(t-1)$
L x T	$(\ell-1)(t-1)$	M_2	$\sigma_b^2 + r\Sigma(LT)^2/(\ell-1)(t-1)$
Error (b)	$[(t-1)(r-1)] + [(t-1)(r-1)(\ell-1)]$	M_1	σ_b^2
Total			

[a] r, ℓ, and t represent the number of replications ($r = 2$), lines ($\ell = 21$), and testers ($t = 7$), respectively; r was considered as random effect while ℓ and t were considered fixed effects.

j = number of lines, $j = 1, 2, 3, \ldots 21$ (whole plots);

k = number of testers, $k = 1, 2, 3, \ldots 7$ (split plots);

ℓ = number of environments, $\ell = 1, 2, 3, \ldots 7$;

μ = overall mean;

E_ℓ = effect of the ℓ^{th} environment, $\ell = 1, 2, 3, \ldots 7$;

$(R/E)_{i\ell}$ = effect of the i^{th} replication within the ℓ^{th} environment;

L_j = effect of the j^{th} line, $j = 1, 2, 3, \ldots 21$;

$(LE)_{j\ell}$ = effect of the interaction between the j^{th} line and the ℓ^{th} environment;

$(LR/E)_{ij\ell}$ = effect of the interaction between the j^{th} line and the i^{th} replication within the ℓ^{th} environment;

T_k = effect of the k^{th} tester, $k = 1, 2, 3, \ldots 7$;

$(TE)_{k\ell}$ = effect of the interaction between the k^{th} tester and the ℓ^{th} environment;

$(LT)_{jk}$ = effect of the interaction between the j^{th} line and the k^{th} tester;

$(LTE)_{jk\ell}$ = effect of the interaction of j^{th} line, k^{th} tester, and the ℓ^{th} environment; and

$e_{ijk\ell}$ = error b.

The format for the analysis of variance and the expected mean squares for the experiments across environments is shown in Table 2. Based on the expected mean squares for the combined across environments, error (b) mean square was used to test for significance of the second-order interaction of lines, testers, and environments mean squares as well as for the interaction between testers by environments. The second-order interaction (L x T x E) mean square was used to test the interaction between lines by testers. The T x E interaction mean squares

Table 2. Format of the analysis of variance and expected mean squares for a combined analysis across environments for a randomized complete block design with a split-plot arrangement

Source of variation	df[a]	Mean squares	Expected mean squares
Environment (E)	(e-1)	M_{10}	$\sigma_b^2 + \ell/(\ell-1)t\sigma_a^2 + \ell t\sigma_r^2/e + r\ell t\sigma_e^2$
Replications (R)/E	e(r-1)	M_9	$\sigma_b^2 + \ell/(\ell-1)t\sigma_a^2 + \ell t\sigma_r^2/e$
Lines (L)	(ℓ-1)	M_8	$\sigma_b^2 + \ell/(\ell-1)t\sigma_a^2 + \ell/(\ell-1)rt\sigma_{\ell e}^2 + rte\Sigma L^2/(\ell-1)$
L x E	(ℓ-1)(e-1)	M_7	$\sigma_b^2 + \ell/(\ell-1)t\sigma_a^2 + \ell/(\ell-1)rt\sigma_{\ell e}^2$
Error (a)	e(ℓ-1)(r-1)	M_6	$\sigma_b^2 + \ell/(\ell-1)t\sigma_a^2$
Testers (T)	(t-1)	M_5	$\sigma_b^2 + t/(t-1)r\ell\sigma_{te}^2 + r\ell e\Sigma T^2/(t-1)$
T x E	(t-1)(e-1)	M_4	$\sigma_b^2 + t/(t-1)r\ell\sigma_{te}^2$
L x T	(ℓ-1)(t-1)	M_3	$\sigma_b^2 + \ell/(\ell-1)t/(t-1)r\sigma_{\ell te}^2 + re\Sigma(LT)^2/(\ell-1)(t-1)$
L x T x E	(ℓ-1)(t-1)(e-1)	M_2	$\sigma_b^2 + \ell/(\ell-1)t/(t-1)r\sigma_{\ell te}^2$
Error (b)	e(t-1)(r-1) + e(ℓ-1)(t-1)(r-1)	M_1	σ_b^2
Total			

[a]e, r, ℓ, and t represent the number of environments (e = 7), replications (r = 2), lines (ℓ = 21), and testers (t = 7), respectively; e and r considered random effects and ℓ and t were considered fixed effects.

was used to test the main effects of testers. The error (a) mean square was used to test the interaction between lines by environments and finally the lines x environments interaction mean square was used to test for variation among lines. Additionally, the source of variation testers was partitioned in orthogonal contrasts to estimate the significance of some contrasts of interest.

Rank correlation for yield (t/ha) was estimated for both testers and lines according with the method proposed by Kendall and Smith (1939) as cited by Ostle (1956). They proposed the concept of rank correlation for use when we have n individuals that are ranked from 1 to n for some specified characteristics by m observers. We would like to know how the m rankings agree with one another. To conduct the rank correlation, Kendall and Smith (1939) proposed a measure known as the coefficient of concordance, W, which is defined by

$$W = \frac{12S}{m^2(n^3-n)} \quad ,$$

where S equals the sum of the squares of the deviations of the total of the ranks assigned to each individual. W varies from 0 to 1; 0 representing no common preference, whereas unity represents prefect agreement among m observers.

Test for significance of W was conducted based on the estimation of a Z value as proposed by Kendall and Smith (1939). The Z value was tested in the Fisher's distribution table (Kendall, 1955). The value of Z is as follows:

$$Z = \frac{1}{2}\log_e \frac{(m-1)W}{1-W} \quad ,$$

using df for the Fisher's distribution as

$(n-1)-\frac{2}{m}$ *for* n_1*; and* $(m-1)[(n-1)-\frac{2}{m}]$ *for* n_2 .

Analysis of variance for the variable yield (t/ha) was conducted for each tester across environments because one of the main criterion to chose a convenient tester is based on the variance among the testcrosses for each tester. This analysis of variance was conducted with the following model:

$$Y_{ij\ell} = \mu + E_\ell + (R/E)_{i\ell} + L_j + (LE)_{j\ell} + e_{ij\ell} \quad ,$$

where

$Y_{ij\ell}$ = observed value for the j^{th} line in the i^{th} replication and in the ℓ^{th} environment;

i = number of replications, $i = 1, 2$;

j = number of lines, $j = 1, 2, 3, \ldots 7$;

ℓ = number of environments, $\ell = 1, 2, 3, \ldots 7$;

μ = overall mean;

E_ℓ = effect of the ℓ^{th} environment, $\ell = 1, 2, 3, \ldots 7$;

$(R/E)_{i\ell}$ = effect of the i^{th} replication within the ℓ^{th} environment;

L_j = effect of the j^{th} line, $i = 1, 2, 3, \ldots 21$;

$(LE)_{j\ell}$ = effect of the interaction between the j^{th} line and the ℓ^{th} environment; and

$e_{ij\ell}$ = error b.

The format for the analysis of variance and the expected mean squares for a single tester combined across environments is shown in Table 3. Based on the expected mean squares for a single tester, the error mean square was used to test for significance of the interaction L x E and the main effect of environments. The interaction L x E mean square was used to test the main effect of lines.

Table 3. Format of the analysis of variance and expected mean squares for a single tester across environments

Source of variation	df[a]	Mean squares	Expected mean squares
Environments (E)	e-1	M_5	$\sigma^2 + r\ell\sigma_e^2$
Replications (R)/E	e(r-1)	M_4	$\sigma^2 + \ell\sigma_r^2/e$
Lines (L)	$(\ell-1)$	M_3	$\sigma^2 + \ell/(\ell-1)r\sigma_{\ell e}^2 + re\Sigma L^2/(\ell-1)$
L x E	$(\ell-1)(e-1)$	M_2	$\sigma^2 + \ell/(\ell-1)r\sigma_{\ell e}^2$
Error	$e(\ell-1)(r-1)$	M_1	σ^2
Total			

[a]r, ℓ, and e represent the number of replications (r = 2), lines (ℓ = 21), and environments (e = 7), respectively; r and e considered as random effects while ℓ was considered fixed effect.

Pearson correlation coefficients for the variable yield (t/ha) were estimated to determine the correlation between testcrosses for each pair of testers and between testcrosses for each tester and the mean of testcrosses across all testers.

Because one of the main objectives of the study was to determine the relative value of the different testers, analysis of variance was conducted for seven agronomic traits considered important for selection: SILK, PLTH, EARH, HUSK, RLOD, PROLIF, and EROT. The mean for each tester for all the traits common for all environments were calculated to make comparisons of the effect of each tester when crossed with the common set of lines.

Yield mean (t/ha) for each testcross was obtained over environments to calculate general combining ability estimates for each line and for each tester.

Combined analysis of variance for the 147 testcrosses was conducted for each of the seven agronomic traits considered important in selection. Testcross means for each location for each of the agronomic traits common for all environments was estimated to quantify the phenotypic effect across environments over each trait.

Yield of the best 10 topcrosses, based on the combined analysis, was compared for each environment as well as their ranking in each environment. The objective of the comparisons of yield and rank among environments was to determine the variation in response to among environments and to identify potential crosses that have stable performance across environments.

At the San Jeronimo location in 1989, a very interesting relationship between southern corn rust and northern corn leaf blight was observed. Data were recorded, and correlation coefficients between rust and northern corn leaf blight, and between them and yield were estimated for the San Jeronimo location alone, as well as for the overall data from those other locations in which rust and leaf blight data were recorded.

Entries identification used at each experiment is as follows:

Entries 1 to 147 ... Testcrosses

Entry 148 ... GB-39 x GB-37	Entry 155 ... HB-83M
Entry 149 ... GB-39 x GB-13	Entry 156 ... HB-85
Entry 150 ... 43-46 x GB-12	Entry 157 ... HB-87
Entry 151 ... 43-46 x 43-69	Entry 158 ... HB-83MD
Entry 152 ... 43-68 x 43-68	Entry 159 ... HS-3G1
Entry 153 ... Synthetic ICTA B-1	Entry 160 ... TACSA
Entry 154 ... GB-39	Entry 161 ... DEKALB

RESULTS AND DISCUSSION

The analysis of variance for yield (t/ha) for the 147 testcrosses (21 lines x 7 testers) evaluated at each of the seven environments is shown in Table 4. The mean yield among environments varied from 1.860 t/ha in environment No. 3 to 7.987 t/ha in environment No. 5, illustrating the large differences in grain yield among the seven environments. Hallauer and Miranda (1988) summarized information relating inbred per se performance with hybrid performance, and emphasized that effective selection among inbreds could be made for certain traits. The final decision for selecting elite inbred lines, however, must be determined from extensive yield evaluation of the lines in crosses. Environment No. 3, which had the lowest yield, was severely affected by dry conditions especially at flowering time. Environment No. 5, which had the highest yield, was under optimum irrigation conditions. Environment No. 5 and environment No. 1 were at the same location, but environment No. 1 was under natural rainfall conditions; thus, difference in yield between environments No. 1 and No. 5 was 0.455 t/ha. The coefficient of variation (C.V.) at each environment was considered satisfactory based on past trials conducted at these environments.

Tester No. 5 had the best testcross mean at environments No. 1, 2, 4, and 5, and the yield of tester No. 5 was only a few kilograms less than the best tester at the other three locations. For each individual environment, the mean yield of the best three testcrosses was significantly greater than the mean yield of the best two checks. The source of variation among testers was significantly different at five of the seven environments. The first-order interaction (L x T) mean square was less than the mean squares of the main effects of lines and testers. Line by tester interactions were not different from zero for environments No. 2, 3, and 4. Environment No. 2 was the only environment in which the

Table 4. Mean squares, means, and C.V. for yield (t/ha) from analysis of variance of 147 testcrosses between 21 lines and 7 testers of corn evaluated at seven environments

Source of variation	df	Environments						
		1	2	3	4	5	6	7
Replications (R)	1	25.53**	0.63ns	12.23**	0.02ns	0.59ns	26.19**	2.80ns
Lines (L)	20	9.25**	1.06ns	3.45**	8.52**	5.81**	2.54ns	3.4**
Error (a)	20	1.34	2.36	0.62	1.29	1.89	1.83	1.82
Testers (T)	6	15.50**	0.99ns	3.38**	8.19**	14.09**	4.68**	2.05ns
L x T	120	2.11**	0.90ns	0.21ns	0.86ns	4.50**	1.11**	1.13**
Error (b)	126	0.59	0.98	0.19	0.73	0.62	0.32	0.56
Total	293							
Yield mean		7.532	6.028	1.860	5.122	7.987	6.740	7.345
Yield mean best tester[a]		8.277	6.205	2.167	5.736	8.624	7.085	7.560
Yield mean best 3 testcrosses		10.110	7.425	3.387	7.752	11.045	8.285	8.905
Yield mean best 2 checks		8.978	6.298	2.508	5.620	9.122	7.540	7.563
C.V. (%)		10.2	16.4	23.6	16.7	9.9	8.3	10.2

[a]Tester = mean of all the crosses for the best tester.

ns, *, ** indicate no significance, and significance at the 0.05 and 0.01 probability levels, respectively.

main effects for lines and testers and the line by tester interaction were not significantly greater than zero.

Because of the wide range of environmental conditions among the seven environments included in this study, the main inferences should be made from the combined analysis across the seven environments (Table 5). Large range of variability among testcrosses, testers, and lines was expected because the environments ranged from 53 m to 1000 m above sea level. Differences among environments, lines, testers, and the interactions of lines and testers with environments were highly significant ($P \leq 0.01$). Variation among environments accounted for a large portion of the variation, but the mean squares for the interactions of lines and testers with the environments were small compared with the mean squares for the main effects of lines and testers. The interactions of lines and testers with environments and lines by testers interaction, however, were highly significant in all instances. The differences among lines and testers were highly significant, indicating that there were differences among lines and testers across environments. The testers by lines interaction also was highly significant, indicating that the different testers ranked the lines differently.

The significant variation expressed among testers and lines suggests significant differences in genetic composition of the lines and testers included. Orthogonal comparisons among testers were highly significant only for the comparisons between tester 6 vs. 7 which are a synthetic and an inbred, respectively, and for the comparison between testers 3 vs. 4 and 5, which are single crosses. The contrasts between the single-cross testers vs. the synthetic and the inbred were not significant.

The mean yield of the 147 testcrosses from the combined analysis across environments was 6.088 t/ha, which was 0.393 t/ha lower than the yield of testcrosses for the greatest yielding tester (tester No. 5). The mean yield of the best three testcrosses was 7.326 t/ha, which was

Table 5. Mean squares, means, and C.V. for yield (t/ha) from the combined analysis of variance of 147 testcrosses between 21 lines and seven testers of corn evaluated across seven environments

Source of variation		df	Mean squares
Environments (E)		6	1298.86**
Replications /E		7	9.71**
Lines (L)		20	11.96**
L x E		120	3.68**
Error (a)		140	1.59
Testers (T)		6	26.47**
Contrast 1,2,3,4,5 vs. 6,7		(1)	0.0082ns
Contrast 6 vs. 7		(1)	42.6818**
Contrast 1,2 vs. 3,4,5		(1)	12.2022ns
Contrast 1 vs. 2		(1)	0.0002ns
Contrast 3 vs. 4,5		(1)	100.2382**
Contrast 4 vs. 5		(1)	3.6678ns
T x E		36	3.74**
L x T		120	4.57**
L x T x E		720	1.04**
Error (b)		882	0.57
Total		2057	
Yield mean			6.088
Yield mean best tester[a]	(tester 5)		6.481
	(line 13 x tester 5)		7.383
Yield best 3 testcrosses	(line 14 x tester 4)		7.319
	(line 4 x tester 5)		7.277
Yield best 2 checks	(HB-85)		6.353
	(Dekalb)		6.234
C.V. (%)			12.4

[a]tester = mean of all the crosses for the best tester.

ns, *, ** indicate no significance, and significance at the 0.05 and 0.01 probability levels, respectively.

1.238 t/ha higher than the mean of the 147 testcrosses and 0.973 t/ha higher than the yield of the best check, ICTA HB-85. Although the first-order interaction mean square for L x T was highly significant, the mean square of the main effect of testers was 5.6 times greater and the mean square for the main effect of lines was 3.2 times greater than the L x T interaction mean square. Similar results were obtained by Russell (1961) in comparisons of testers for selecting stalk strength in corn. He concluded that the higher variance for the main effect of lines and testers than the interaction L x T means that the additive genetic effects were of greater importance than nonadditive effects. LeFord and Russell (1985), however, concluded that the significant L x T interaction can be inferred as the presence of nonadditive gene effects. Rissi and Hallauer (1991) also studied different types of testers and, in all instances, the variance components of lines were greater than their respective L x T interactions. Matzinger (1953) reported that the desirable feature of smaller lines x testers interaction was observed with use of a heterogeneous tester than with use of a narrow genetic-base tester. The coefficient of variation for the combined analysis was 12.4% which was considered satisfactory in making inferences from the analysis of the data obtained in this study.

The relative rankings for yield of the 21 lines by the seven testers and the rankings of the seven testers by the 21 lines are shown in Tables 6 and 7, respectively. These rankings of lines and testers were used to calculate the rank correlation among testers and among lines as described by Kendall and Smith (1939). They proposed to estimate the coefficient of concordance (W) to determine the coincidence of the rankings. A highly significant coefficient of concordance of 0.485 was obtained for the ranking of the lines by the seven testers. The coefficient of concordance for the ranking of the seven testers by the 21 lines was 0.350 which was also significant at 1% level of probability. The two

Table 6. Ranking for yield (t/ha) of 21 lines by seven testers based on the evaluation of 147 corn testcrosses at seven environments

Lines	Testers 1	2	3	4	5	6	7	Sum[a]	Dev[b]	Squa[c]
	Ranking by testers									
1	21	15	13	5	6	5	4	69	-8	64
2	16	18	15	18	20	20	18	125	48	2304
3	15	9	4	8	16	12	13	77	0	0
4	5	7	20	3	2	7	15	59	-18	324
5	8	5	12	10	17	8	10	70	- 7	49
6	4	14	11	15	13	3	11	71	- 6	36
7	19	19	16	20	21	21	14	130	53	2809
8	11	10	7	11	15	14	12	80	3	9
9	18	17	18	19	8	19	17	116	39	1521
10	3	2	2	6	9	4	8	34	-43	1849
11	14	3	10	9	7	16	2	61	-16	256
12	7	6	5	21	4	15	3	61	-16	256
13	1	12	19	2	1	1	1	37	-40	1600
14	2	1	1	1	3	6	5	19	-58	3364
15	12	4	14	4	5	2	9	50	-27	729
16	13	11	3	14	12	9	19	81	4	16
17	17	16	9	17	18	17	21	115	38	1444
18	9	20	21	16	10	10	20	106	29	841
19	10	8	8	7	19	11	6	69	- 8	64
20	6	13	17	13	14	13	7	83	6	36
21	20	21	6	12	11	18	16	104	27	729
								77[d]		18300[e]

[a]Sum = sum of ranks.

[b]Dev = deviations from the mean.

[c]Squa = squared deviations.

[d] = mean.

[e] = sum of the squared deviations.

Table 7. Ranking for yield (t/ha) of seven testers by 21 lines based on the evaluation of 147 corn testcrosses at seven environments

Lines	Testers 1	2	3	4	5	6	7	
	Ranking by lines							
1	7	6	5	2	1	3	4	
2	5	3	1	2	6	4	7	
3	7	4	3	1	5	2	6	
4	5	4	7	2	1	3	6	
5	4	3	7	2	5	1	6	
6	3	7	6	4	2	1	5	
7	5	2	1	3	6	4	7	
8	4	6	5	1	3	2	7	
9	5	3	7	4	1	2	6	
10	6	5	4	1	2	3	7	
11	7	3	6	4	1	5	2	
12	4	3	6	7	1	5	2	
13	4	6	7	3	1	2	5	
14	3	5	4	1	2	6	7	
15	6	4	7	2	1	3	5	
16	5	6	3	4	2	1	7	
17	6	5	1	3	2	4	7	
18	4	5	7	3	1	2	6	
19	5	4	6	1	7	2	3	
20	5	6	7	2	1	3	4	
21	6	7	3	2	1	4	5	
Sum[a]	106	97	103	54	52	62	114	84[d]
Dev[b]	22	13	19	-30	-32	-22	30	
Squa[c]	484	169	361	900	1024	484	900	4322[e]

[a]Sum = sum of ranks.

[b]Dev = deviations from the mean.

[c]Squa = squared deviations.

[d] = mean.

[e] = sum of the squared deviations.

estimates of coefficients of concordance suggest that in both instances the rankings of the lines by testers and testers by lines were relatively consistent. We also can make some inferences from the data identified as sum of rank in Tables 6 and 7. The rank summation index in Table 6, based on the rank of lines by the seven testers, indicates that lines No. 14, 10, and 13 were the three lines that were ranked consistently high by the seven testers. Based on the rank summation index of the testers, testers No. 5 and 4 were more consistent in ranking the relative yields of the lines (Table 7).

One of the main objectives of this study was to determine the more convenient tester for ranking the set of 21 lines. An analysis of variance for each tester across the seven environments was conducted (Table 8). Most of the variation for each of the testers was due to environmental effects. The coefficient of variation obtained for the seven testers was satisfactory for each tester in making valid inferences. For each tester, the differences among testcrosses were significant as well as the interaction of the testcrosses by environments. The single-cross tester (No. 3) had the lowest yield performance (5.687 t/ha) across the 21 lines, but the largest variation (0.75) among testcrosses. The synthetic tester (No. 6) was the second highest yield (6.354 t/ha) across lines, but tester No. 6 had lower variation (0.08) among testcrosses. The variation among testcrosses for tester No. 7 (0.35), which is an inbred, was not as great as was expected. Matzinger (1953) and Getschman and Hallauer (1991) reported greater variability among testcrosses using an inbred line than using either single crosses or double crosses as testers. Matzinger (1953) reported that the variance for the lines x testers interaction decreased as the heterogeneity of the tester increased. Testcross means for tester No. 4, 5, and 6 were greater than the mean for the 147 testcrosses, which was 6.088 t/ha. The difference in variation among testers suggests that

Table 8. Mean squares, means, and C.V. for yield (t/ha) from the combined analysis of variance for each tester of corn evaluated at seven environments

		Testers						
Source of variation	df	1	2	3	4	5	6	7
Environments (E)	6	194.18**	158.26**	178.23**	217.76**	201.52**	200.99**	170.35**
Replications (R)/E	7	2.70**	1.34ns	2.24**	2.18**	1.78*	1.60*	2.27**
Lines (L)	20	4.58**	3.36**	12.72**	6.25**	4.10**	2.17*	6.21**
L x E	120	1.65**	1.04*	2.21**	1.45**	1.11**	1.12**	1.33**
Error	140	0.79	0.75	0.61	0.74	0.67	0.65	0.76
Total	293							
Yield mean		5.977	5.978	5.687	6.323	6.481	6.354	5.815
Variation (L)[a]		0.21	0.16	0.75	0.34	0.21	0.08	0.35
Variance (L x E)[b]		0.43	0.14	0.80	0.36	0.22	0.52	0.28
C.V. (%)		14.9	14.5	13.7	13.6	12.6	12.7	15.0

ns, *, ** indicate no significance, and significance at the 0.05 and 0.01 probability levels, respectively.

[a]Variation for lines (L) based on the expected mean squares.

[b]Estimate of L x E interaction component of variance based on the expected mean squares.

the testers have different genetic factors for discriminating differences among lines for their relative yields in crosses.

Pearson correlations between the 21 testcrosses for each of the seven testers and the correlations of the testcrosses for each tester with the mean value of the testcrosses across the seven testers are listed in Table 9. For the 21 possible correlations between the seven testers, only five were significant. The correlations between each tester with the mean of the seven testers, however, were significant for all testers except tester No. 3. The nonsignificant correlation for tester No. 3 is the only one that disagreed with the highly significant coefficient of concordance (W) given in Tables 6 and 7. Testers No. 2 and 7 had the highest correlations (0.77) with the tester means, while tester No. 3 had a nonsignificant correlation (0.276). Tester No. 3, however, had the highest variation among testcrosses. Abel and Pollak (1991) evaluated eight different testers to screen unadapted germplasm and found differences in ranking among testers. They concluded that more than one tester should be involved to screen accessions. Similar recommendation was made by Keller (1949) who suggested that use of two or more testers allows comparisons of the rankings by the testers as well as the variances among the testcrosses for each tester.

The mean squares from the analysis of variance for each tester for seven agronomic traits considered important for selection are listed in Table 10. Differences among SILK, PLTH, EARH, and HUSK were significantly different from zero for all the testers except tester No. 2 in which the differences for HUSK were not significantly different. Mean squares for RLODG, PROLIF, and EROT were not significantly different from zero in most instances for the seven testers. The variation among lines for each tester for the seven traits was lower than the variation from the combined analysis of variance of the 147 testcrosses (seven testers).

Table 9. Correlation coefficient between seven testers for the evaluation of yield (t/ha) of corn testcrosses evaluated at seven environments

Tester	Test-1	Test-2	Test-3	Test-4	Test-5	Test-6	Test-7	All-test[a]
Test-1	1.000	0.539 *	-0.250 ns	0.254 ns	0.405 ns	0.595 **	0.409 ns	0.611 **
Test-2		1.000	0.289 ns	0.188 ns	0.275 ns	0.387 ns	0.584 **	0.773 **
Test-3			1.000	-0.105 ns	-0.365 ns	-0.257 ns	0.138 ns	0.276 ns
Test-4				1.000	0.283 ns	0.604 **	0.220 ns	0.549 **
Test-5					1.000	0.658 **	0.402 ns	0.521 *
Test-6						1.000	0.532 ns	0.734 **
Test-7							1.000	0.774 **
All-test[a]								1.000

[a]All-test = mean of the seven testers.

ns, *, ** indicate no significance, and significance at the 0.05 and 0.01 probability levels, respectively.

Table 10. Mean squares for seven agronomic traits for each tester from the evaluation of 147 testcrosses between 21 lines and seven testers of corn across seven environments

	Traits[a]						
	SILK	PLTH	EARH	HUSK	RLODG	PROLIF	EROT
Tester	(no)	(cm)	(cm)	(%)	(%)	(%)	(%)
1	17.22**	451.72**	300.90*	66.28*	54.72*	128.62ns	116.21ns
2	16.20**	539.95**	282.11**	29.74ns	84.65ns	153.28ns	127.26ns
3	27.14**	577.04**	304.00*	80.46**	34.59*	355.63*	110.45ns
4	14.02**	481.93**	304.09**	58.62**	81.49*	246.12*	131.55ns
5	5.92**	793.04**	441.65**	47.95**	103.95ns	122.71ns	143.32ns
6	23.36**	506.82**	305.49**	25.64*	232.31**	192.56ns	136.24ns
7	20.10**	575.67**	413.04**	38.03*	36.29ns	174.62ns	348.92**
Combined[b]	101.79**	2927.00**	1520.87**	184.41**	293.06**	535.73ns	681.16**

[a]Traits designations are as follows : number of days from planting to silk emergence (SILK); plant (PLTH) and ear (EARH) height; % of plants with bad husk cover (HUSK); % of plants with root lodging (RLODG); number of ears relative to number of plants in percentage (PROLIF); % of ears rotted (EROT).

[b]Combined = mean squares from combined analysis of variance.

ns, *, ** indicate no significance, and significance at the 0.05 and 0.01 probability levels, respectively.

The tester means for the 11 traits across the seven environments are listed in Table 11. Least significant differences (LSD) for each trait is included to make comparisons among testers. According to the LSD value for yield (0.791 t/ha), only testers No. 3 and 5 showed significant differences. For the other 10 traits, only plant height (PLTH) and ear height (EARH) had some instances of significant differences.

General combining ability (GCA) estimates for both lines and testers and the yield mean for each of the 147 testcrosses across the seven environments are presented in Table 12. General combining ability estimates for testers ranged from -0.401 for tester No. 3 to 0.393 for tester No. 5. Testers No. 4, 5, and 6 had positive estimates of GCA, while the other testers had negative GCA estimates. The inbred tester No. 7 showed the second lowest estimate of GCA (-0.273), while the synthetic tester No. 6 showed the second highest GCA (0.266). For the 21 lines, the GCA estimates ranged from -0.604 for line No. 7 to 0.701 for line No. 14. Lines No. 14, 10, and 13 had the highest, positive GCA estimates of 0.701, 0.467, and 0.385 estimates, respectively. Line No. 13 x tester No. 5 (7.383 t/ha), line No. 14 x tester No. 4 (7.319 t/ha), and line No. 4 x tester No. 5 (7.277 t/ha) were the three best testcrosses. Tester performance across the set of 21 lines, and how the different testers ranked each of the 21 lines are shown in Figure 1. The ranking of each tester also can be compared with the rank expressed by the mean of the seven testers (M-7). Figure 2 shows the ranking of the best five lines on the average by the seven testers. Besides the best five lines, the other lines were grouped and averaged as those which showed positive estimates of GCA (X-Pg) and those which showed negative estimates of GCA (X-Ng). The mean of the 21 lines (M-21) also is included in Figure 2 as reference point to make comparisons.

The significance levels of the mean squares for the combined analysis across the seven environments of the 147 testcrosses for seven

Table 11. Means for yield and for agronomic traits for each tester from the evaluation of 147 testcrosses between 21 lines and seven testers of corn across seven environments

	Traits[a]										
	YIELD	STAND	SILK	PLTH	EARH	HUM	HUSK	RLODG	SLODG	PROLIF	EROT
Tester	(t/ha)	(no)	(no)	(cm)	(cm)	(%)	(%)	(%)	(%)	(%)	(%)
1	5.977	41.4	64.0	231.9	122.4	19.7	5.8	2.7	1.0	92.0	14.2
2	5.978	40.8	63.1	233.2	123.9	19.5	4.5	4.2	1.0	94.6	14.2
3	5.687	39.4	64.3	232.1	122.6	20.0	5.7	2.4	0.4	92.1	13.0
4	6.323	41.4	64.7	233.7	123.7	20.1	4.3	4.5	0.5	95.8	12.4
5	6.481	42.0	64.0	238.1	129.8	19.5	3.6	5.5	0.8	94.9	12.0
6	6.354	41.5	63.4	226.1	117.9	19.9	3.1	5.3	0.7	98.1	11.1
7	5.815	40.3	63.5	225.8	118.1	19.9	4.0	2.3	0.5	96.3	15.2
Average	6.088	40.9	63.9	231.6	122.6	19.8	4.4	3.8	0.7	94.8	13.2
LSD (P=0.05)	0.791	2.8	1.3	11.2	9.8	1.1	3.9	6.3	2.7	8.9	8.3

[a]Traits designations are as follows: grain yield (YIELD) in metric tons per hectar; number of plants at harvesting (STAND); number of days from planting to silk emergence (SILK); plant (PLTH) and ear (EARH) height; % of grain humidity (HUM) at harvesting; % of plants with bad husk cover (HUSK); % of plants with root (RLODG) and stem (SLODG) lodging; number of ears relative to number of plants in percentage (PROLIF); % of ears rotted (EROT).

Table 12. Yield mean (t/ha) for each testcross between line by tester and general combining ability estimate for testers and lines based on the evaluation of 147 testcrosses of corn across seven environments

Line	Tester 1	2	3	4	5	6	7	x^a	gi^b
1	4.646	5.754	5.965	6.745	6.750	6.615	6.319	6.113	.025
2	5.584	5.676	5.889	5.827	5.521	5.656	5.163	5.617	-.471
3	5.744	6.142	6.369	6.556	6.091	6.431	5.796	6.161	.073
4	6.311	6.359	3.593	6.856	7.277	6.603	5.236	6.033	-.055
5	6.214	6.396	5.972	6.452	6.060	6.526	6.059	6.240	.152
6	6.333	5.876	5.975	6.263	6.461	6.660	5.976	6.220	.132
7	5.472	5.594	5.622	5.579	5.306	5.539	5.275	5.484	-.604
8	6.138	6.106	6.126	6.439	6.165	6.222	5.915	6.159	.071
9	5.538	5.680	5.198	5.622	6.743	5.844	5.214	5.691	-.397
10	6.426	6.554	6.636	6.694	6.679	6.640	6.259	6.555	.467
11	5.777	6.515	6.004	6.497	6.746	6.149	6.702	6.341	.253
12	6.224	6.376	6.162	4.104	6.966	6.171	6.527	6.076	-.012
13	7.100	5.931	3.648	7.106	7.383	7.205	6.943	6.473	.385
14	6.908	6.632	6.694	7.319	7.082	6.605	6.284	6.789	.701
15	6.017	6.455	5.928	6.783	6.917	6.716	6.227	6.435	.347
16	5.996	5.959	6.404	6.339	6.503	6.525	5.022	6.107	.019
17	5.583	5.708	6.089	6.007	6.018	6.003	4.493	5.700	-.388
18	6.168	5.064	3.440	6.206	6.649	6.502	4.912	5.563	-.525
19	6.138	6.159	6.089	6.561	5.854	6.451	6.283	6.219	.131
20	6.252	5.919	5.466	6.405	6.413	6.399	6.278	6.162	.074
21	4.942	4.684	6.149	6.418	6.509	5.971	5.236	5.701	-.387
x^c	5.977	5.978	5.687	6.323	6.481	6.354	5.815	6.088	
gi^d	-.111	-.110	-.401	.235	.393	.266	-.273		

[a]x = mean of each line across testers, LSD (P=0.05)= 0.771.

[b]gi = general combining ability estimate for lines.

[c]x = mean of each tester across lines, LSD (P=0.05)= 0.791.

[d]gi = general combining ability estimate for testers.
LSD (P=0.05) for the testcrosses = 0.173.

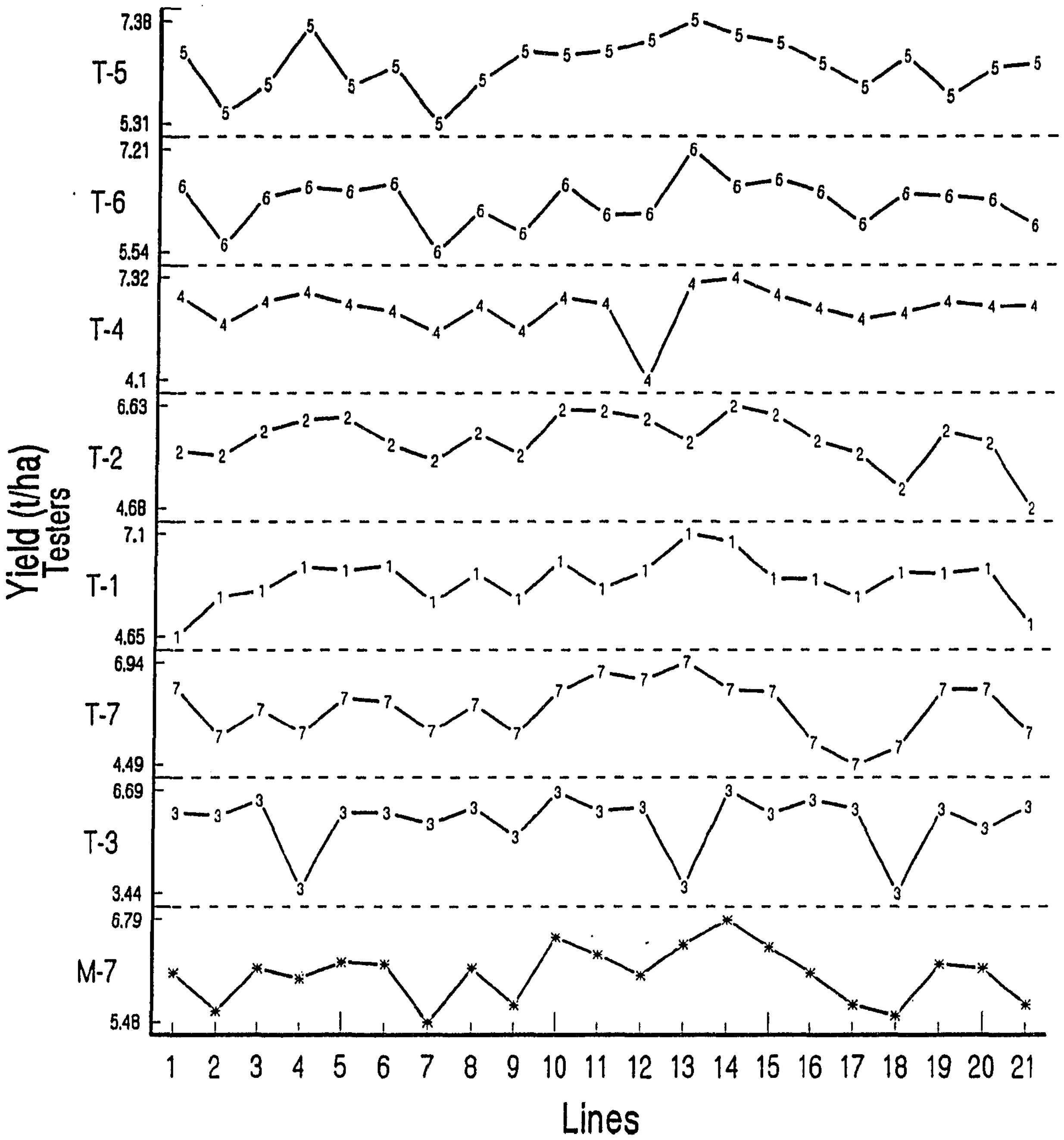

Figure 1. Yield (t/ha) for seven testers across 21 lines of corn from the evaluation at seven environments

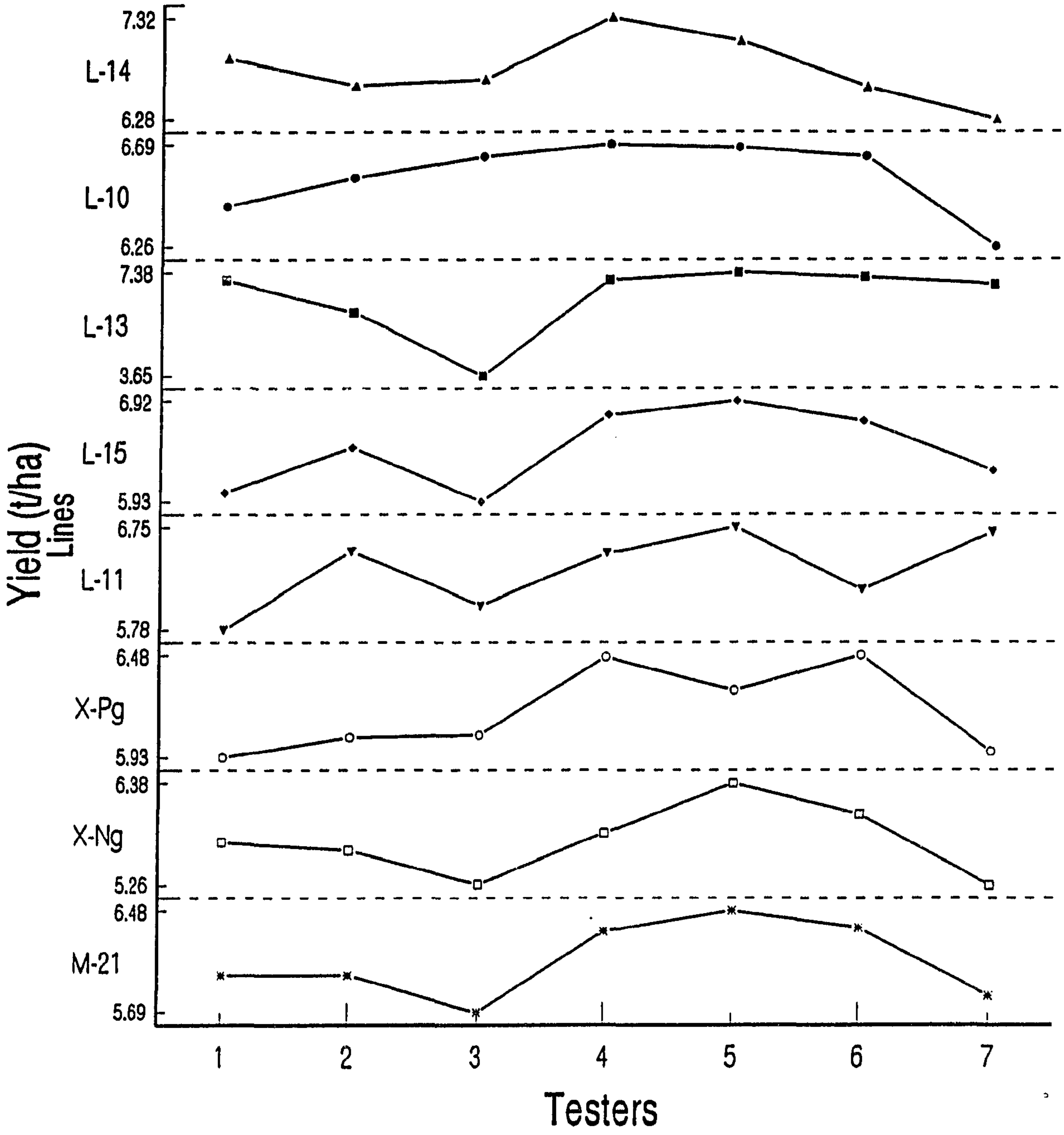

Figure 2. Yield (t/ha) for five selected lines and three groups of lines of corn across seven testers from the evaluation at seven environments

agronomic traits are listed in Table 13. In most instances, the mean squares for the main effect of lines and testers and their interactions were highly significant. The means for yield and agronomic traits expressed at each environment are listed in Table 14. Based on the LSD values, differences among environments were found for all the traits except for RLODG and SLODG. These results emphasize the importance of determining the performance of different genotypes in contrasting environments, which show the level at which the genotypes selected are expected to be perform.

The best 10 testcrosses for yield (t/ha) and their ranking at each environment based on the combined analysis are shown on Table 15. Five of the best 10 testcrosses involved line No. 13 and tester No. 5, which is a single-cross. These results are not in complete agreement with Rissi and Hallauer (1991) who reported that the narrow-genetic based tester had testcrosses with higher yield performance than testcrosses of broad-genetic based testers. The ranking of the 10 best testcrosses based on the combined analysis was different than the ranking of the testcrosses at each specific environment. For instance, testcross L13 x T5, which ranked first based on the combined analysis, ranked third at environment No. 1, but ranked only 113 at environment No. 2. The larger ranges for the testcrosses were expressed at those environments at which maximum potential of the testcrosses was obtained, such as environment No. 1 (6.890 t/ha) and environment No. 5 (10.005 t/ha). The ranking for the mean value of the 147 testcrosses, however, was generally consistent across the different environments. There were testcrosses that performed better than the best check, ICTA HB-85. The testcrosses of this study identified triple testcrosses that can be further evaluated for their potential release as new hybrids. The contrasting performance of the genotypes across environments illustrates the difficulty of identifying selections that have stable performance across a wide range of

Table 13. Significant mean squares, means and C.V. for the combined analysis of variance of seven agronomic traits from the evaluation of 147 testcrosses between 21 lines and seven testers of corn across seven environments

		Traits[a]						
Source of variation	df	SILK	PLTH	EARH	HUSK	RLODG	PROLIF	EROT
Environment (E)	6	**	**	**	**	**	**	**
Replications/E	7	**	**	**	*	ns	**	**
Lines (L)	20	**	**	**	**	**	ns	**
L x E	120	ns	*	ns	**	*	**	**
Error (a)	140							
Testers (T)	6	**	**	**	**	**	**	ns
T x E	36	**	**	**	**	**	**	**
L x T	120	**	*	*	**	**	**	ns
L x T x E	720	ns	ns	**	**	*	**	ns
Error (b)	882							
Total	2057							
Mean		63.9	231.5	122.6	4.4	3.8	94.8	13.2
C.V. (%)		2.0	4.6	7.6	84.2	156.9	9.0	60.5

[a]Traits designations are as follows : number of days from planting to silk emergence (SILK); plant (PLTH) and ear (EARH) height; % of plants with bad husk cover (HUSK); % of plants with root lodging (RLODG); number of ears relative to number of plants in percentage (PROLIF); % of ears rotted (EROT).

ns, *, ** indicate no significance, and significance at the 0.05 and 0.01 probability levels, respectively.

Table 14. Means for yield and for agronomic traits for each environment from the evaluation of 147 testcrosses between 21 lines and seven testers of corn

	Traits[a]										
	YIELD	STAND	SILK	PLTH	EARH	HUM	HUSK	RLODG	SLODG	PROLIF	EROT
Environment	(t/ha)	(no)	(no)	(cm)	(cm)	(%)	(%)	(%)	(%)	(%)	(%)
1	7.532	41.4	70.1	245.4	126.0	21.2	4.4	6.1	1.0	101.5	4.6
2	6.028	37.2	53.0	243.1	130.2	19.4	6.8	2.1	0.9	98.2	7.8
3	1.860	42.7	53.2	228.6	135.9	16.6	2.1	0.2	0.1	66.6	60.9
4	5.122	40.1	55.2	253.8	134.4	21.1	2.1	7.4	1.2	93.0	9.0
5	7.987	40.2	90.8	210.6	105.2	19.8	8.6	0.3	0.8	110.3	3.0
6	6.740	41.5	62.4	228.6	120.4	18.2	2.7	1.4	0.6	97.9	4.5
7	7.345	41.8	62.4	210.7	106.2	22.3	4.2	9.5	0.5	96.1	2.5
Average	6.088	40.7	63.9	231.6	122.6	19.8	4.4	3.8	0.7	94.8	13.2
LSD (P=0.05)	1.335	4.7	3.1	22.3	18.8	1.8	6.2	10.1	2.9	12.0	11.6

[a]Traits designations are as follows: grain yield (YIELD) in metric tons per hectar; number of plants at harvesting (STAND); number of days from planting to silk emergence (SILK); plant (PLTH) and ear (EARH) height; % of grain humidity (HUM) at harvesting; % of plants with bad husk cover (HUSK); root (RLODG) and stem (SLODG) lodging; number of ears relative to number of plants in percentage (PROLIF); % of ears rotted (EROT).

Table 15. Yield (t/ha) across seven environments and ranking for the best 10 testcrosses based on the combined analysis from the evaluation of 147 testcrosses between 21 lines and seven testers

Crosses[a]	Combined[b]	Environments 1	2	3	4	5	6	7
L13xT5	7.383/1	9.985/3	5.640/113	2.075/49	7.945/2	9.555/12	7.765/10	8.715/5
L14xT4	7.319/2	8.970/22	5.935/86	2.320/34	8.185/1	9.215/17	7.645/17	8.960/1
L4xT5	7.277/3	9.065/17	5.935/85	1.420/113	6.480/18	10.805/3	8.670/1	8.565/8
L13xT6	7.205/4	10.145/2	5.300/131	1.740/77	7.000/6	10.075/6	7.760/11	8.415/12
L13xT4	7.106/5	9.820/5	5.080/140	2.490/26	6.620/14	10.450/5	7.365/33	7.915/37
L13xT1	7.100/6	9.860/4	5.815/98	1.725/81	6.810/8	9.110/22	7.525/24	8.855/3
L14xT5	7.082/7	8.960/23	7.030/8	2.860/13	7.065/4	9.115/21	7.090/50	7.455/83
L12xT5	6.966/8	10.200/1	6.385/40	2.320/33	6.155/25	8.840/30	7.235/40	7.630/63
L13xT7	6.943/9	9.135/16	5.485/125	2.195/42	6.715/10	9.475/14	6.780/84	8.815/4
L15xT5	6.917/10	8.360/37	6.320/48	3.155/4	6.795/9	8.165/79	7.800/9	7.825/47
Mean[c]	6.088/88	7.532/81	6.028/75	1.860/64	5.122/72	7.987/94	6.740/85	7.345/89
Check[d]	6.353/58	7.455/86	5.310/131	2.665/19	5.200/65	8.405/60	7.255/40	8.185/18
LSD/P=5%	0.173	0.177	0.229	0.101	0.198	0.182	0.130	0.173
Range[c]	3.943	6.890	5.035	3.270	5.880	10.005	5.460	4.425

[a]Crosses = L identifies the number of the line and T identifies the number of the tester involved.

[b]Combined = yield mean from the combined analysis across the seven environments.

[c]Mean and Range = from the 147 testcrosses inclded in the experiment.

[d]Check = the best check from the combined analysis, which was ICTA HB-85.
Note: numbers after the slash indicate the ranking of that yield in the experiment.

environments. There were significance differences among the best 10 testcrosses for yield across the seven environments (Table 15). If the 10 best testcrosses are compared with the best check and the LSD (0.173 t/ha) used to determine significance, each of the 10 testcrosses was significantly greater yielding than the yield of the best check (6.353 t/ha). There were differences in ranking of the 10 best yielding testcrosses. L13 x T5, for example, had the greatest yield across environments, but L13 x T5 relative rankings among environments ranged from 2 (Environment No. 4) and 3 (Environment No. 1) to 113 (Environment No. 2). L14 x T5 and L12 x T5, however, had relatively good yield in all environments. The testcross L4 x T5 had relatively good yields in higher yield environments (No. 1, 5, 6, 7), but relatively poor yields in poorer yield environments (No. 2 and 3). Therefore, different genotypes for different environments may have to be considered after taking account the profitability of seed production.

A summary of the information needed to make the choice of the more convenient tester, based on the evaluation for yield (t/ha) of testcrosses involving a set of 21 lines and a set of seven testers, is included in Table 16. The ranking of the lines by the testers in descending order, based on the mean performance of the seven testers, is shown in the column identified as $\overline{X}^a$. The dotted line at the center of Table 16 is the position of the testcross mean for the average of the seven testers (6.088 t/ha). Table 16 also includes the performance of each tester per se (per-se[b]), the average of the testcrosses for each tester (crosses[c]), the variance estimate for each tester (variance[d]), the general combining ability estimate for each tester (GCA[e]), and the correlations between each tester and the overall mean of the seven testers (correlat[f]). Some lines were ranked very consistently by each of the seven testers. For instance, line No. 14 ranked first on the average

Table 16. Ranking for yield (t/ha) of 21 lines by seven testers and statistics parameters estimated as useful information for selecting a convenient tester for a hybrid program

	Testers							
	1	2	3	4	5	6	7	X[a]
Rank	Lines							
1	13	14	14	14	13	13	13	14
2	14	10	10	13	4	15	11	10
3	10	11	16	4	14	6	12	13
4	6	15	3	15	12	10	1	15
5	4	5	12	1	15	1	14	11
6	20	12	21	10	1	14	19	5
7	12	4	8	19	11	4	20	6
8	5	19	19	3	9	5	10	19
9	18	3	17	11	10	16	15	20
10	19	8	11	5	18	18	5	3
11	8	16	6	8	21	19	6	8
12 (mean)	15	13	5	21	16	3	8	1
13	16	20	1	20	6	20	3	16
14	11	6	15	16	20	8	7	12
15	3	1	2	6	8	12	4	4
16	2	17	7	18	3	11	21	21
17	17	9	20	17	5	17	9	17
18	9	2	9	2	17	21	2	9
19	7	7	13	9	19	9	16	2
20	21	18	4	7	2	2	18	18
21	1	21	18	12	7	7	17	7
Per-se[b]	5.865	6.897	5.939	5.349	4.499	5.716	2.514	5.254
Crosses[c]	5.977	5.978	5.687	6.323	6.481	6.354	5.815	6.088
Variance[d]	4.58	3.36	12.72	6.25	4.10	2.17	6.21	
GCA[e]	-.111	-.110	-.401	.235	.393	.266	-.273	
Correlat[f]	.61**	.77**	.28ns	.55**	.52*	.73**	.77**	

[a]Ranking based on the mean of the seven testers. [b]Yield tester per-se.
[c]Mean of the testcrosses. [d]Testcross mean square.
[e]General Combining Ability. [f]Correlation with mean of seven testers.

of the seven testers, and line No. 14 also was among the top ranking lines for each individual tester. Similar consistency occurred for lines No. 13 and No. 10. Similar consistency of ranking was observed for some lines that had relatively poor testcross yields for each tester; for instance, lines No. 7 and No. 2 (Tables 6 and 16). There were some lines that had inconsistent testcross yields among the different testers. For example, line No. 9 had a relatively low ranking of testcross yield by seven testers, but line No. 9 had the eighth ranked testcross yield with tester No. 5 (Table 16). Genter (1963) proposed that genes from the tester parent could mask and interact with those from the inbreds in crosses; thus, the performance of the testcrosses could not accurately determine genotype of the lines under study.

Testers are used to discard lines that have below average combining ability. Those lines that have below average testcross performance are discarded. Based on that concept and considering the mean of the seven testers as a reference point, tester No. 7, which is an inbred, is one tester that ranked the 21 lines similar to the mean of the seven testers. Eleven lines ranked by tester No. 7 were also above the mean based on the average of the seven testers. Tester No. 7 had the highest correlation with the average of the seven testers (0.774). However, in the practical sense tester No. 7 would not be the more suitable tester in Guatemala because tester No. 7 is an inbred line. Tester No. 7 identified superior yielding single crosses which are not recommended for the specific market in Guatemala for which hybrids are expected to be released. Tester No. 3 had the greatest variation among testcrosses (0.75), had the lowest general combining ability estimate (-0.401), and the poorest correlation with the average of the seven testers (0.276) (Table 16). Hallauer (1975) concluded that a suitable tester should provide information on the correct ranking of the relative merit of the lines under test. Although tester No. 3 had the largest mean square (12.72), which is a desirable feature, if we take into account the mean value from the average of the seven testers, tester No. 3 would have eliminated lines No. 13 and No. 15, which were identified by almost all the other testers to be included among the best lines. Tester No. 6 had a broader genetic-base and had a high correlation (0.734) with the average of the seven testers. Tester No. 6 also had the lowest variation among testcrosses (0.08). Making comparisons about the relationship of the testers performance per se and the variation among their testcrosses, the results of this study did not show a definite trend for this relationship. These results disagree with the results obtained by Rawlings and Thompson (1962) and Hallauer and Lopez (1979) who concluded that the assumed low frequency of favorable alleles at important loci present in low performing testers will give the greatest variability among testcrosses, which is desirable for efficient selection among lines.

The results of this study, and those obtained by other authors, emphasizes the relative nature in the choice of the best tester. The proper choice of testers has to depend on the objectives of each specific program. This was emphasized by Matzinger (1953) and Hallauer et al. (1988), who recommended that the choice of tester by breeders for either early or late testing should be based on the stage of development of every breeding program, genotypes to be tested, alternative testers available, and type of hybrids expected to be produced with the materials under selection.

Based on the practical objectives of this study, tester No. 4 seems to be a good compromise to consider as the convenient tester. Tester No. 4 had the second largest variation among testcrosses (0.34), following tester No. 3 which had the greatest variance among testcrosses (0.75). Tester No. 4 also had some other favorable features, such as a positive estimate of GCA (0.235), which can be important for identification of elite crosses for extensive evaluation and continued inbreeding. Horner et al. (1976) stated that even though a homozygous line can be considered the best tester, if the lines under selection are expected to be used for three-way or double-cross hybrids, an established single-cross tester that is considered a good seed parent would be a good choice because the genotypes from selection would be more easily used in commercial production. Tester No. 4 also had a positive GCA estimate, and a positive GCA would be useful specially if that tester is expected to be involved as one parent for potential hybrids to be released. Another good feature of tester No. 4 was a highly significant correlation (0.55) with the average of the seven testers, which agrees with the conclusion of Abel and Pollak (1991) in using this information for making a choice of the more efficient tester. For the ranking observed among the 21 lines and the mean of the seven testers, tester No. 4 identified 10 lines above the mean. With the exception of tester No. 7 which is an S_3 line, all the other testers could be considered as broad-genetic base testers because the level of inbreeding of the parents involved. On this point, Hallauer and Lopez (1979) suggested that with the heterogeneity of broad-base testers, the only objective of the topcross is to obtain an initial measure of the combining ability of the lines.

At environment No. 1 a significant correlation was found between yield and the diseases northern corn leaf blight (Exserohilium turcicum (Pass.) =Helminthosporium turcicum Pass.), and southern corn rust (Puccinia polysora Underw). Pearson correlation coefficient (r) between leaf blight and rust was highly significant (r = 0.96); correlation coefficients between yield and rust and between yield and leaf blight were both highly significant (r = -0.74). Because of the wide range of environments used in the evaluation, main inferences should be taken from the combined analysis. Pearson correlation coefficients, therefore, were estimated between yield and rust, and yield and leaf blight based on the mean of environments No. 1, 5, and 6 from which data were recorded.

Although correlation coefficients for the three environments were smaller than environment No. 1 alone, they were highly significant. The correlation coefficient between leaf blight and rust was $r = 0.83^{**}$; between yield and rust $r = -0.63^{**}$; and between yield and leaf blight $r = -0.58^{**}$. Figure 3 shows the three-dimensional relationship among yield, rust, and leaf blight. Figure 3 shows how most of the high yielding lines had the lowest scores for rust and leaf blight; for instance, lines No. 14, 1, and 3. Genter (1963) recommended that a program for developing hybrids must be concerned with the development of inbred lines with the simultaneous selection for many traits which determine the net worth of the lines. Hallauer (1975) also concluded that "effective selection for disease and insect resistance and for agronomic traits in combination with the inbred tester should enhance the development of new superior lines that are useful in combination with other elite lines."

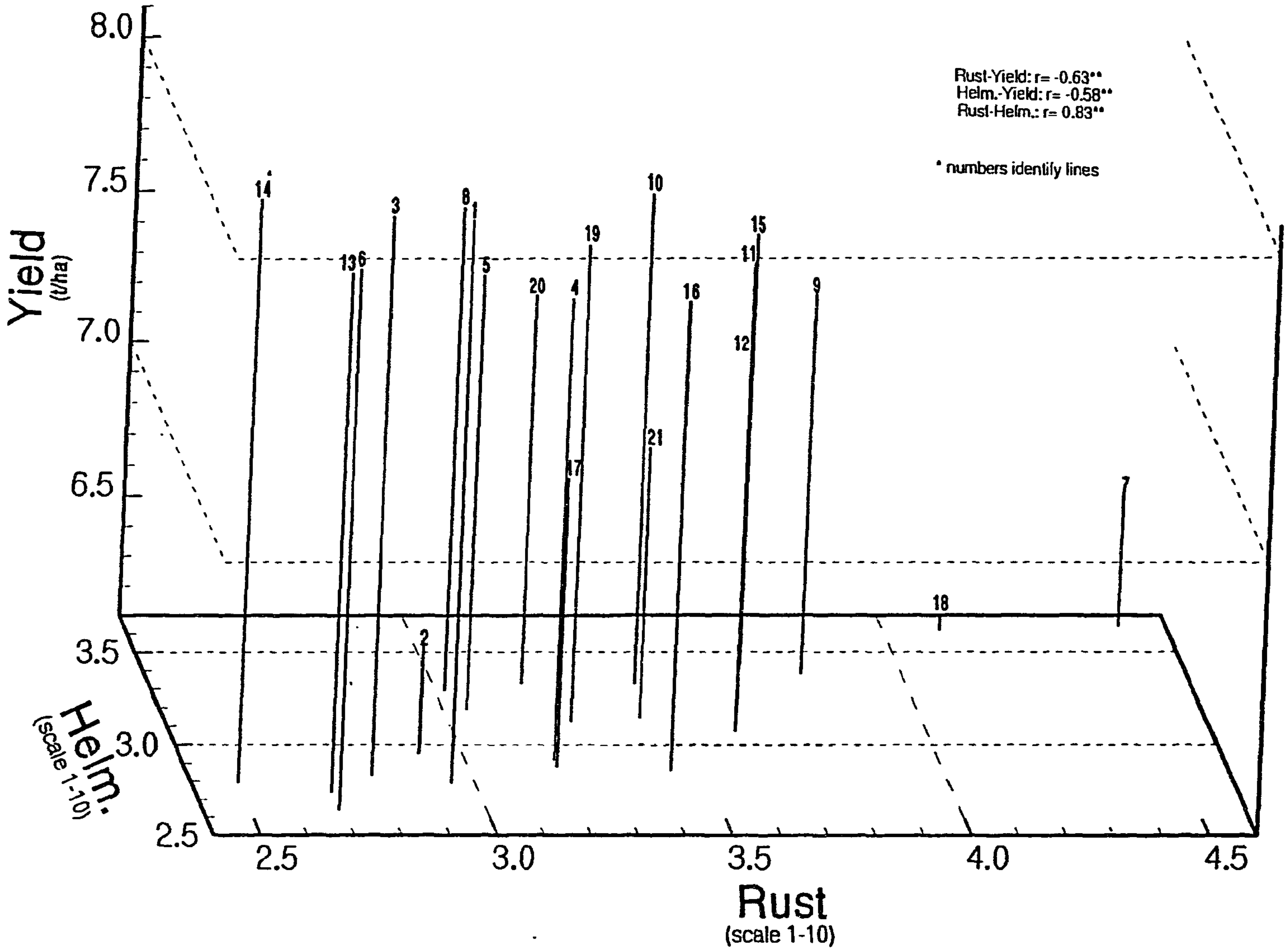

Figure 3. Three-dimensional relationship for the correlation among yield, rust, and helminthosporium for 21 lines evaluated as topcrosses by seven testers at three environments

CONCLUSIONS

The 147 possible testcrosses between seven testers and 21 lines of corn (*Zea mays* L.) were evaluated at seven environments in Guatemala. Yield and agronomic traits were recorded, but main inferences were made on yield (t/ha) to study the relative performance of testers for identifying elite lines for a hybrid breeding program.

The combined analysis for yield (t/ha) showed highly significant differences ($P \leq 0.01$) for the sources of variation for environments, lines, testers, and the interactions of lines and of testers with environments. Highly significant differences among lines and testers indicate there were differences among lines and testers across environments. The testers by lines interaction was also highly significant indicating inconsistent ranking of the lines by the testers. Significant differences among testcrosses for days to silk, plant and ear height, and husk score were found for all testers except tester No. 2 in which the differences for husk score were not significantly different.

Yield mean for the 147 testcrosses across environments was 6.088 t/ha and the greatest yielding tester was tester No. 5 (6.481 t/ha). The mean yield of the best three testcrosses was 7.326 t/ha, which was 0.973 t/ha greater than the best check, ICTA HB-85. Greater mean square for the main effects of lines and testers than for the interaction indicated that additive genetic effects were of greater importance than nonadditive effects. Testers No. 4, 5, and 6 had positive estimates of general combining ability (GCA), while testers No. 1, 2, 3, and 7 had negative GCA estimates for yield. Lines No. 14, 10, and 13 had the highest, positive GCA estimate of 0.701, 0.467, and 0.385 t/ha, respectively.

Highly significant coefficients of concordance (W) were obtained for yield for both line rankings and tester rankings suggesting that, in both instances, the rankings were relative consistent. Similar results were obtained from the Pearson correlation coefficients between each tester with the mean of the seven testers, except for tester No. 3 which did not have a significant correlation with the mean of the seven testers. Testers No. 2 and No. 7 had the highest correlations with the testers mean, while tester No. 3 had the only nonsignificant correlation (0.276); tester No. 3, however, had the greatest variation among testcrosses.

There were significant differences for yield among the best 10 testcrosses across the seven environments. All of the best 10 testcrosses were significantly greater yielding than the best check. Because of the wide range of environmental conditions used in the evaluation trials, differences in ranking of the 10 best yielding testcrosses occurred among environments. Five of the best 10 testcrosses across the seven environments involved line No. 13 and tester No. 5, suggesting stable expression of specific combining ability for these two genotypes. Some lines were ranked consistently by each of the seven testers, whereas other lines were ranked inconsistently. Tester No. 7 ranked the 21 lines more similar to the mean of the seven testers, but tester No. 7 was not considered the more suitable tester because it is an inbred line. Single crosses are not recommended presently for the specific market in Guatemala because of seed production problems. Tester No. 3 had the largest variation among testcrosses, which is a desirable feature for a suitable tester. Tester No. 3, however, had the lowest GCA estimate and the poorest correlation with the average of the seven testers. The relationship between tester performance per se and the variation among their testcrosses did not show a definite trend that could be useful to identify the most suitable tester.

Hallauer et al. (1988) and Matzinger (1953), emphasized that the choice of tester will depend on the objectives and characteristics of each specific program. Based on the practical objectives of this study and on the results, tester No. 4 seems to be an acceptable option to consider as the convenient tester for the situation in Guatemala. Tester No. 4 had the second largest variation among testcrosses, positive estimate of GCA, highly significant correlation with the average of the seven testers, and acceptable performance per se. These are the main factors considered in the choice of tester No. 4 as the convenient tester for the specific breeding program under consideration.

There were triple testcrosses that performed better than the best check, ICTA HB-85; therefore, these superior testcrosses can be further evaluated as potential hybrids to be release. The highly significant correlation between yield and corn leaf blight and yield and southern corn rust reflects that, along with yield and agronomic traits, selection for disease resistance should be emphasized to identify the net worth of lines to be involved in potential hybrid combinations. This study emphasized the relative importance of the decisions that are necessary in making the choice of the best or more convenient tester based on the evaluation of testcrosses between a specific set of lines crossed to several alternative potential testers.

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GENERAL SUMMARY

Research has been conducted to determine those factors that describe either the best or the more convenient tester for selecting elite lines for a corn hybrid breeding program. The objectives of this study were (1) to obtain information on the importance of determining the most adequate tester for screening lines in a hybrid breeding program; (2) to determine the relative performance of different testers in ranking a specific set of lines from different origins; and (3) to identify the most convenient tester for screening lines by early testing (S_2 or S_3) for a hybrid breeding program in which three-way or double-cross hybrids are more commonly used. The 147 possible testcrosses from the cross of seven testers and 21 lines, the seven testers per se and a set of seven checks were evaluated in a randomized complete block design with a split-plot arrangement and two replications. Seven contrasting environments in Guatemala were used for evaluation.

Main inferences were made from the combined analysis for yield (t/ha). Highly significant differences ($P \leq 0.01$) were found for the source of variation of environments, lines, testers, and the interactions of lines and testers with environments. The greatest yielding tester was tester No. 5 which is a single-cross. A highly significant coefficient of concordance (W) and highly significant correlation coefficients suggested that, in most instances, the ranking of the lines by the testers was relative consistent. Significant differences among testers also were found for days to silk, plant and ear height, and husk extension of ears. Testers No. 4, 5, and 6 showed positive estimates of general combining ability and lines No. 14, 10, and 13 had the highest, positive estimates of general combining ability. The best 10 testcrosses were significantly greater yielding than the best check, ICTA HB-85. Five of the best 10 testcrosses across the seven environments involved line No. 13 and tester No. 5. The relationship between tester performance per se and the variance expressed among testcrosses did not show any useful trend for making the selection of the more suitable tester.

Tester No. 4 seems to be a good compromise to be considered as the convenient tester for the hybrid breeding program in Guatemala. The choice of tester No. 4 was based on the second largest variance among testcrosses, positive estimate of general combining ability, a highly significant correlation with the average of the seven testers, and acceptable performance per se as a tester parent. Triple testcrosses that performed better than the best check were identified for further evaluation as potential new hybrids for release. Highly significant correlations between yield and southern corn rust and yield and northern corn blight suggested that selection of this traits should be emphasized during the inbred developed process.

Based on the relative results obtained from evaluation of testcrosses, every situation should be considered separately in making recommendations for the more convenient tester that complements the objectives of every specific hybrid breeding program.

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APPENDIX. ENTRY MEANS FOR EACH ENVIRONMENT AND ACROSS SEVEN ENVIRONMENTS

SAN JERONIMO 1989 (ENVIRONMENT No. 1)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
1	1	1	74.5	252.5	130.0	37.5	24.7	6.650	5.40	3.90	1.20	101.0	9.0	6.95	3.0	38.35	3.0	0
2	1	2	72.5	232.5	110.0	42.5	23.0	6.925	1.20	1.15	0.00	94.0	7.5	7.15	3.0	17.80	4.0	0
3	1	3	74.0	270.0	132.5	44.0	26.6	8.890	0.00	6.80	0.00	108.0	2.0	3.40	2.5	29.55	3.5	0
4	1	4	73.5	260.0	132.5	42.5	24.2	9.350	5.30	3.40	0.00	111.0	4.0	4.80	3.0	24.95	3.5	0
5	1	5	72.5	245.0	137.5	43.5	24.1	8.980	2.40	4.60	1.15	97.5	3.5	1.15	3.0	26.55	4.0	0
6	1	6	72.5	260.0	132.5	44.0	24.2	9.030	2.05	5.65	0.00	114.5	4.0	1.15	3.0	20.50	3.0	0
7	1	7	72.0	237.5	125.0	44.0	24.9	8.140	0.00	7.95	1.15	110.5	6.5	6.80	3.0	37.50	4.0	0
8	2	1	69.0	230.0	115.0	39.0	20.3	6.820	6.60	10.25	0.00	96.5	6.5	3.90	3.0	33.35	4.5	0
9	2	2	68.0	255.0	125.0	37.0	22.0	7.000	9.45	2.80	2.65	102.5	7.0	1.30	3.0	15.15	3.5	0
10	2	3	70.0	245.0	125.0	40.5	21.4	7.560	6.20	2.35	0.00	101.5	7.5	1.30	3.0	14.30	3.5	0
11	2	4	70.5	237.5	117.5	40.0	23.9	7.055	11.05	9.85	0.00	101.5	6.5	3.75	3.0	19.80	3.5	0
12	2	5	70.0	252.5	135.0	39.5	21.3	7.240	9.10	15.20	2.55	97.5	4.0	6.30	3.0	18.90	4.0	0
13	2	6	66.5	225.0	102.5	37.0	22.2	6.870	6.25	4.20	0.00	109.0	5.0	2.95	3.0	24.85	4.0	0
14	2	7	68.5	227.5	95.0	35.0	21.2	5.680	10.40	0.00	1.35	93.5	6.0	14.35	3.0	14.50	3.5	0
15	3	1	67.5	262.5	137.5	43.5	19.2	8.410	4.45	12.60	1.15	101.0	8.0	1.15	3.0	23.15	3.0	0
16	3	2	66.5	227.5	110.0	40.0	19.2	7.835	4.95	17.45	2.45	101.5	5.0	2.50	2.5	20.20	3.0	0
17	3	3	69.0	257.5	130.0	44.0	21.2	9.490	11.10	12.50	1.15	102.0	6.5	1.15	3.0	23.85	3.5	0
18	3	4	71.5	237.5	132.5	43.0	21.0	8.335	2.25	19.75	0.00	103.5	2.0	1.15	2.5	22.10	3.5	0
19	3	5	70.5	242.5	137.5	44.0	21.9	8.740	0.00	5.70	1.15	97.5	3.5	1.15	3.0	25.00	3.5	0
20	3	6	67.5	232.5	120.0	43.5	20.7	9.445	2.15	11.40	3.40	103.5	5.5	0.00	3.0	23.15	3.5	0
21	3	7	71.0	250.0	120.0	43.5	21.4	7.735	4.50	8.05	1.15	99.0	3.5	3.40	3.0	19.70	3.0	0
22	4	1	72.0	262.5	137.5	40.5	21.3	7.630	5.25	6.30	1.15	103.5	13.0	1.30	3.5	40.80	4.5	0
23	4	2	72.0	250.0	125.0	41.0	21.4	7.405	5.80	12.45	1.30	103.0	3.5	1.30	3.0	17.35	3.0	0
24	4	3	71.5	247.5	125.0	20.0	21.4	3.460	0.00	16.85	0.00	98.5	7.5	10.95	3.5	39.40	3.5	0
25	4	4	73.5	260.0	130.0	44.0	22.5	8.780	2.15	18.15	0.00	105.0	4.5	0.00	3.0	39.75	4.0	0
26	4	5	71.0	262.5	142.5	44.0	21.0	9.065	2.40	20.45	2.30	96.5	6.0	0.00	3.0	20.45	4.0	0
27	4	6	73.0	242.5	122.5	43.5	22.3	8.980	2.40	14.85	0.00	101.5	4.5	1.15	3.0	29.85	4.5	0
28	4	7	73.5	262.5	135.0	34.0	20.7	5.485	4.30	7.80	1.60	102.5	3.0	1.60	3.0	37.50	4.0	0
29	5	1	72.0	237.5	120.0	38.0	21.7	7.755	7.35	0.00	1.15	110.5	7.5	7.20	3.0	41.10	3.5	0
30	5	2	68.5	237.5	110.0	43.0	21.4	8.010	4.60	1.20	1.15	101.0	6.0	2.40	3.0	21.20	3.5	0
31	5	3	71.0	230.0	110.0	42.5	22.6	7.835	5.95	2.25	0.00	99.0	4.5	4.70	3.0	31.10	4.0	0
32	5	4	71.5	230.0	115.0	42.0	21.0	8.165	5.90	0.00	0.00	99.0	6.0	2.35	3.0	28.45	3.5	0
33	5	5	71.0	235.0	120.0	43.5	21.7	7.920	6.25	4.65	0.00	92.0	4.0	5.75	3.0	28.85	4.0	0
34	5	6	70.0	217.5	105.0	43.5	21.2	8.810	3.20	1.15	1.15	107.0	8.0	0.00	3.0	23.05	3.5	0
35	5	7	70.5	230.0	115.0	42.0	21.4	7.620	4.70	8.35	0.00	102.0	3.5	1.20	2.5	26.20	3.5	0
36	6	1	68.5	245.0	130.0	43.0	20.4	8.230	9.25	12.80	0.00	98.5	2.0	4.7	2.0	7.00	2.5	0
37	6	2	65.5	235.0	117.5	41.0	18.5	6.900	10.60	1.25	0.00	102.5	4.5	3.75	2.5	7.30	3.0	0
38	6	3	67.5	240.0	125.0	43.5	21.5	7.840	10.40	3.40	0.00	98.0	2.5	1.15	2.5	11.55	3.0	0
39	6	4	70.0	245.0	132.5	44.0	21.1	9.285	4.45	13.60	0.00	103.5	4.5	1.15	2.5	7.95	2.5	0
40	6	5	70.0	250.0	125.0	42.0	20.7	9.390	15.20	2.35	1.20	101.0	4.5	0.00	2.5	10.80	3.0	0

SAN JERONIMO 1989 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
41	6	6	65.5	235.0	125.0	44.0	19.4	9.480	6.05	5.65	2.25	112.5	1.0	0.00	2.5	10.25	2.5	0
42	6	7	66.0	250.0	125.0	43.0	20.1	8.200	4.60	4.65	0.00	101.5	2.5	2.35	2.5	10.35	3.5	0
43	7	1	68.5	245.0	122.5	44.0	18.6	5.740	1.20	0.00	2.30	92.0	5.0	3.40	4.5	65.90	6.5	0
44	7	2	66.5	230.0	120.0	43.0	18.8	6.135	4.65	0.00	1.15	100.0	5.5	1.15	4.0	62.80	6.0	0
45	7	3	69.0	235.0	115.0	43.0	21.8	6.580	2.70	9.30	0.00	89.5	5.5	3.45	4.0	65.80	5.5	0
46	7	4	70.5	250.0	127.5	43.5	21.8	6.805	4.70	2.25	1.15	97.5	7.5	1.15	4.0	69.20	6.0	0
47	7	5	70.5	240.0	125.0	42.5	19.5	4.765	0.00	4.75	5.90	84.5	16.5	5.90	5.0	68.55	7.0	0
48	7	6	69.5	235.0	115.0	41.5	19.9	6.510	2.15	2.55	1.15	103.5	2.5	2.55	3.5	63.05	5.5	0
49	7	7	69.5	225.0	110.0	41.5	19.0	5.140	4.90	0.00	2.45	102.5	5.0	1.30	4.5	61.90	6.0	0
50	8	1	69.5	237.5	110.0	44.0	19.7	8.250	4.40	4.50	0.00	105.5	6.5	1.15	3.0	12.50	3.5	0
51	8	2	67.5	235.0	115.0	43.0	18.6	7.715	5.70	10.50	1.15	102.5	4.5	2.35	3.0	10.50	3.0	0
52	8	3	70.0	237.5	132.5	44.0	19.6	8.205	9.05	10.20	1.15	101.0	3.5	2.30	3.0	17.05	3.0	0
53	8	4	71.0	250.0	130.0	44.0	20.7	8.980	3.50	4.50	0.00	102.5	4.0	1.15	3.0	14.80	3.0	0
54	8	5	70.0	235.0	127.5	44.0	19.0	8.370	3.35	6.80	1.15	102.5	3.5	0.00	3.0	14.80	3.5	0
55	8	6	67.0	235.0	120.0	42.0	19.9	7.940	3.10	11.90	1.20	113.0	2.0	2.40	3.0	11.90	3.5	0
56	8	7	68.0	237.5	125.0	44.0	18.7	7.540	3.75	9.05	1.15	96.5	6.0	2.25	3.0	11.35	3.5	0
57	9	1	71.0	262.5	145.0	44.0	20.0	6.160	0.00	7.95	4.50	94.5	6.5	2.25	4.0	54.55	6.0	0
58	9	2	70.0	250.0	147.5	43.5	18.7	7.260	2.35	8.05	3.40	96.5	2.0	0.00	4.0	60.55	5.5	0
59	9	3	73.0	262.5	137.5	42.0	22.9	7.030	5.15	1.20	0.00	93.0	6.5	1.20	3.5	76.60	4.5	0
60	9	4	72.0	272.5	160.0	43.5	20.0	7.305	0.00	8.05	1.15	104.5	4.5	1.15	4.0	76.05	6.0	0
61	9	5	70.0	255.0	135.0	44.0	19.7	8.130	0.00	11.35	5.70	104.5	3.0	0.00	3.5	65.95	4.5	0
62	9	6	71.0	242.5	125.0	44.0	21.0	7.205	0.00	12.50	4.55	98.0	3.5	2.25	3.5	67.05	5.5	0
63	9	7	70.5	255.0	140.0	38.5	20.6	5.780	0.00	7.80	0.00	109.5	3.5	1.30	4.0	32.50	5.5	0
64	10	1	69.5	240.0	122.5	44.0	20.0	6.280	0.00	4.50	2.25	96.5	3.5	0.00	4.0	48.85	5.5	0
65	10	2	67.0	260.0	132.5	44.0	19.5	7.460	0.00	2.25	2.30	93.0	5.0	1.15	4.0	21.60	4.0	0
66	10	3	70.5	265.0	145.0	44.0	20.8	8.705	5.90	0.00	0.00	96.5	3.5	1.15	3.5	29.60	4.5	0
67	10	4	70.5	270.0	132.5	44.0	21.8	8.135	0.00	5.65	0.00	100.0	0.0	0.00	3.5	39.80	3.5	0
68	10	5	70.5	275.0	140.0	42.5	20.1	8.205	1.15	9.40	0.00	100.0	2.0	1.15	3.5	27.00	4.0	0
69	10	6	66.5	252.5	120.0	43.5	20.3	8.070	2.35	2.35	0.00	99.0	4.5	0.00	4.0	35.65	5.5	0
70	10	7	67.0	252.5	130.0	42.0	19.3	6.790	2.40	4.75	0.00	99.0	2.5	3.75	4.5	49.10	6.0	0
71	11	1	70.0	257.5	130.0	44.0	20.6	6.735	0.00	1.15	0.00	94.5	1.0	3.40	3.0	40.90	5.5	0
72	11	2	68.0	252.5	127.5	43.5	19.4	7.865	4.65	6.90	1.15	99.0	4.5	1.15	3.5	38.00	5.0	0
73	11	3	70.5	262.5	132.5	43.5	22.0	7.335	8.30	4.60	0.00	96.5	3.5	3.40	3.0	42.65	5.0	0
74	11	4	70.5	257.5	132.5	43.5	20.9	7.275	6.80	2.25	0.00	101.0	4.5	1.15	3.5	51.65	4.5	0
75	11	5	68.5	262.5	137.5	43.5	19.0	8.665	1.15	5.75	2.30	102.0	1.0	0.00	3.5	40.25	5.0	0
76	11	6	67.5	245.0	125.0	40.5	20.9	7.445	2.25	2.65	0.00	97.0	5.0	2.65	3.0	44.15	4.5	0
77	11	7	67.0	255.0	127.5	43.5	20.0	8.565	8.10	2.25	2.35	99.0	3.5	2.35	4.0	48.05	6.0	0
78	12	1	69.5	245.0	130.0	44.0	22.0	7.990	2.10	4.55	0.00	101.0	4.0	1.15	3.5	48.90	5.0	0
79	12	2	69.0	247.5	130.0	43.0	19.9	7.715	5.85	3.50	1.15	100.0	2.0	0.00	3.5	62.80	5.0	0
80	12	3	68.0	247.5	130.0	43.0	22.1	7.495	6.05	0.00	1.20	95.0	6.0	0.00	3.5	49.60	4.5	0

SAN JERONIMO 1989 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
81	12	4	71.0	245.0	117.5	22.0	20.0	4.275	13.95	0.00	0.00	108.5	9.5	4.60	3.5	51.65	5.0	0
82	12	5	70.0	250.0	150.0	42.5	22.7	10.200	3.25	9.40	0.00	109.5	4.5	2.35	2.0	3.55	3.0	0
83	12	6	70.0	225.0	100.0	44.0	20.9	8.455	0.00	10.20	0.00	102.5	1.0	0.00	3.5	68.20	5.5	0
84	12	7	68.5	245.0	122.5	42.0	19.6	7.795	2.40	1.25	0.00	97.5	2.5	1.15	4.0	61.80	5.0	0
85	13	1	70.0	257.5	139.5	44.0	22.7	9.860	6.75	2.25	0.00	101.0	3.5	1.15	3.0	4.60	2.5	0
86	13	2	69.5	242.5	132.5	32.5	23.0	7.195	3.05	1.65	1.65	112.0	2.5	1.45	2.5	10.95	3.0	0
87	13	3	72.0	225.0	112.5	20.5	20.8	3.310	0.00	9.10	0.00	96.5	10.0	3.55	3.5	49.50	4.5	0
88	13	4	71.0	255.0	145.0	44.0	23.9	9.820	4.60	5.65	0.00	124.0	6.5	1.15	2.5	5.70	3.0	0
89	13	5	70.5	265.0	157.5	43.0	22.2	9.985	1.95	12.95	1.20	115.0	2.0	2.35	2.0	4.70	2.0	0
90	13	6	69.5	240.0	120.0	44.0	23.5	10.145	3.75	4.55	0.00	122.0	4.0	0.00	2.0	4.60	2.5	0
91	13	7	68.5	247.5	135.0	44.0	23.7	9.135	2.00	0.00	0.00	112.5	5.0	3.40	2.5	3.45	2.5	0
92	14	1	68.5	232.5	127.5	43.5	22.6	9.320	4.30	4.60	0.00	107.0	6.5	1.15	2.5	5.75	3.0	0
93	14	2	70.0	222.5	117.5	41.0	21.2	7.805	4.55	7.25	1.25	108.5	3.5	1.20	2.5	8.55	2.5	0
94	14	3	70.0	245.0	140.0	44.0	23.2	8.480	7.75	0.00	0.00	102.5	5.5	2.30	2.5	7.95	3.5	0
95	14	4	70.5	250.0	135.0	43.5	24.2	8.970	12.10	8.05	0.00	105.0	4.0	0.00	2.5	5.75	3.0	0
96	14	5	70.0	240.0	137.5	43.0	23.3	8.960	1.10	1.15	0.00	102.5	4.5	2.30	2.0	5.85	2.5	0
97	14	6	69.0	242.5	122.5	44.0	23.5	8.615	5.35	2.25	0.00	106.0	5.5	1.15	2.5	10.25	2.5	0
98	14	7	70.0	225.0	112.5	40.5	23.6	6.750	12.25	0.00	0.00	102.5	2.5	3.65	2.5	7.60	2.5	0
99	15	1	70.0	267.5	135.0	44.0	21.1	6.075	0.00	3.40	2.25	96.5	2.0	1.15	4.5	72.75	6.0	0
100	15	2	68.5	257.5	137.5	43.5	20.7	7.580	1.20	5.75	0.00	96.5	2.0	0.00	4.0	62.95	5.0	0
101	15	3	70.0	265.0	147.5	42.0	21.9	7.135	2.25	2.25	1.15	95.0	5.0	1.25	4.0	64.30	6.0	0
102	15	4	71.5	265.0	137.5	44.0	21.5	8.180	0.00	2.25	3.40	93.0	2.5	0.00	4.0	65.90	5.5	0
103	15	5	70.5	270.0	142.5	43.0	20.8	8.360	2.40	8.00	1.15	100.0	2.0	0.00	4.0	69.05	5.0	0
104	15	6	68.0	257.5	127.5	44.0	20.3	8.120	0.00	5.70	0.00	99.0	2.0	2.30	4.0	63.65	5.5	0
105	15	7	70.0	260.0	130.0	43.5	19.9	6.970	1.30	6.80	1.15	94.5	3.5	3.50	4.0	69.20	5.5	0
106	16	1	71.0	237.5	112.5	43.5	20.1	8.255	8.30	0.00	0.00	98.0	5.0	3.40	2.5	13.95	3.5	0
107	16	2	69.0	252.5	132.5	43.5	18.5	7.085	3.30	0.00	1.15	106.0	3.5	2.35	3.0	44.45	4.0	0
108	16	3	70.5	252.5	130.0	43.5	20.8	8.070	5.75	0.00	0.00	100.0	2.5	2.35	3.5	15.10	3.5	0
109	16	4	71.5	245.0	130.0	43.0	21.7	8.765	6.85	0.00	0.00	109.0	6.0	2.40	2.5	15.30	3.5	0
110	16	5	71.5	252.5	135.0	44.0	21.5	9.535	1.90	6.80	0.00	106.5	2.0	3.40	3.0	23.90	3.0	0
111	16	6	70.0	235.0	120.0	44.0	20.2	9.160	3.15	5.70	1.15	116.0	3.0	1.15	2.5	12.50	3.5	0
112	16	7	70.5	232.5	117.5	41.5	18.6	6.775	7.95	0.00	0.00	106.5	6.0	3.70	3.5	18.65	3.5	0
113	17	1	70.5	230.0	97.5	41.0	20.5	6.715	10.05	0.00	1.15	98.5	5.0	5.00	3.0	26.10	4.0	0
114	17	2	69.5	250.0	122.5	44.0	20.8	6.780	3.75	2.25	0.00	101.0	3.5	5.70	3.0	23.85	3.5	0
115	17	3	71.5	232.5	112.5	40.5	22.2	7.600	2.65	2.25	0.00	102.5	6.0	2.70	3.0	18.55	4.0	0
116	17	4	74.0	237.5	105.0	38.5	23.0	6.115	3.90	6.80	0.00	96.5	8.5	3.05	2.5	16.30	3.0	0
117	17	5	70.5	257.5	142.5	40.0	21.3	7.480	5.90	3.70	0.00	96.0	4.0	2.50	3.0	44.10	3.5	0
118	17	6	73.0	225.0	94.5	41.0	21.6	7.820	5.95	2.25	1.15	107.0	4.5	2.45	3.0	13.05	3.0	0
119	17	7	71.5	215.0	95.0	35.5	26.5	4.105	7.85	0.00	1.25	100.0	11.0	6.10	3.0	17.55	3.5	0
120	18	1	71.0	242.5	130.0	43.5	20.5	5.890	4.95	9.25	2.30	94.0	3.5	2.25	4.0	72.50	6.0	0

SAN JERONIMO 1989 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
121	18	2	68.0	247.5	127.5	38.5	20.5	5.840	2.70	3.85	5.15	89.5	7.0	0.00	4.0	62.00	5.5	0
122	18	3	71.5	252.5	127.5	20.5	20.6	4.165	12.35	16.50	0.00	112.5	5.0	0.00	4.0	63.90	5.0	0
123	18	4	72.5	247.5	130.0	43.5	21.7	6.420	2.40	23.25	1.15	97.5	1.0	0.00	4.5	73.80	6.5	0
124	18	5	71.0	245.0	132.5	43.5	20.7	7.075	1.15	20.85	8.05	102.5	1.0	0.00	4.0	57.75	5.5	0
125	18	6	69.5	235.0	125.0	44.0	21.1	6.650	1.10	21.55	1.15	98.5	2.0	0.00	5.0	93.15	6.0	0
126	18	7	72.5	247.5	122.5	18.5	19.8	3.780	15.15	4.75	0.00	109.0	10.0	4.75	3.5	55.35	5.0	0
127	19	1	69.5	232.5	112.5	42.0	19.8	6.550	4.85	7.05	1.25	94.0	4.0	2.50	3.5	38.55	4.5	0
128	19	2	69.0	240.0	125.0	44.0	20.3	7.175	5.65	6.85	0.00	100.0	3.5	0.00	4.0	29.55	4.0	0
129	19	3	71.0	260.0	140.0	43.0	22.3	7.440	4.70	11.50	0.00	95.0	3.5	2.35	3.5	45.60	4.0	0
130	19	4	71.0	255.0	137.5	44.0	22.8	8.030	3.40	18.20	0.00	97.5	3.5	0.00	3.0	44.30	5.0	0
131	19	5	72.5	247.5	125.0	43.5	20.7	7.185	3.70	4.55	1.15	91.5	3.5	3.40	3.0	26.55	3.5	0
132	19	6	70.0	220.0	115.0	44.0	20.0	7.930	4.60	11.35	1.15	99.0	4.5	1.15	3.5	31.85	4.5	0
133	19	7	68.0	230.0	112.5	42.5	18.9	6.020	4.25	0.00	6.90	103.5	4.5	3.60	3.5	29.65	4.0	0
134	20	1	70.5	247.5	130.0	44.0	23.9	7.270	2.30	2.25	2.30	99.0	6.0	1.15	3.5	43.20	4.5	0
135	20	2	71.0	232.5	120.0	44.0	22.0	6.950	4.90	3.40	0.00	93.0	4.5	2.25	3.5	29.55	4.0	0
136	20	3	72.0	235.0	120.0	37.5	23.8	6.290	5.70	4.00	0.00	94.5	4.5	4.00	4.0	46.50	4.0	0
137	20	4	71.5	255.0	130.0	44.0	22.0	7.570	3.50	4.55	1.15	98.0	1.0	3.40	3.5	42.05	4.5	0
138	20	5	71.0	235.0	117.5	44.0	21.0	7.720	2.20	0.00	0.00	100.0	3.0	2.25	3.5	39.80	4.5	0
139	20	6	71.0	215.0	102.5	41.0	21.7	7.495	6.00	2.25	0.00	105.0	4.5	2.65	4.0	50.10	5.5	0
140	20	7	72.0	232.5	120.0	43.5	19.9	7.485	4.05	1.15	0.00	93.0	2.5	2.30	3.5	39.20	3.5	0
141	21	1	71.0	232.5	120.0	41.5	19.2	6.165	0.00	2.50	0.00	98.5	5.0	3.75	3.5	43.15	5.0	0
142	21	2	72.0	260.0	127.5	24.5	21.6	4.625	2.40	19.55	0.00	105.5	4.0	5.00	3.5	36.05	4.5	0
143	21	3	70.0	265.0	132.5	42.0	20.3	8.245	6.85	7.15	0.00	103.5	2.0	0.00	3.5	34.55	4.5	0
144	21	4	71.0	257.5	135.0	44.0	21.2	9.215	3.95	5.65	0.00	115.5	3.0	1.15	3.0	33.00	4.5	0
145	21	5	69.0	250.0	130.0	37.5	18.4	7.850	8.00	14.60	1.30	100.0	8.0	0.00	3.0	40.00	4.0	0
146	21	6	70.0	242.5	120.0	39.0	20.5	8.220	6.75	7.35	0.00	113.5	6.0	6.35	3.5	42.30	4.5	0
147	21	7	71.0	242.5	122.5	31.0	19.3	5.465	8.70	0.00	3.20	114.5	8.5	6.50	3.5	47.10	4.5	0
148	22	1	71.0	257.5	135.0	41.0	19.9	7.185	0.00	4.90	1.25	93.0	5.5	4.95	4.0	36.65	4.5	0
149	22	2	66.5	262.5	135.0	42.5	18.9	9.195	1.00	7.05	1.15	109.5	1.0	2.35	3.5	19.90	4.5	0
150	22	3	71.0	257.5	130.0	43.5	20.4	7.610	0.00	4.60	3.50	95.5	8.5	0.00	3.5	32.25	4.5	0
151	22	4	73.0	257.5	130.0	39.0	22.4	6.750	2.55	3.85	0.00	101.5	6.5	5.10	4.0	34.65	4.5	0
152	22	5	70.5	252.5	132.5	19.0	19.7	4.005	0.00	15.55	0.00	113.5	5.0	13.05	4.0	50.85	4.5	0
153	22	6	70.5	225.0	112.5	44.0	20.4	7.650	1.90	7.95	1.15	113.5	4.0	0.00	3.0	29.60	4.0	0
154	22	7	71.5	175.0	90.0	32.5	16.8	1.130	0.00	0.00	2.80	86.0	16.0	6.25	5.0	55.95	7.0	0
155	23	1	72.0	260.0	122.5	39.0	20.6	7.240	2.55	1.20	3.90	96.0	4.0	1.35	3.0	33.65	4.0	0
156	23	2	69.0	262.5	132.5	42.0	20.2	7.455	7.40	2.45	2.35	94.0	4.0	3.55	3.5	34.80	4.5	0
157	23	3	70.0	242.5	122.5	39.0	20.5	7.195	5.20	2.50	0.00	99.0	3.0	1.25	4.0	42.15	5.0	0
158	23	4	73.0	235.0	107.5	42.0	21.2	7.160	2.65	3.50	1.25	95.0	2.5	2.50	3.0	34.45	4.5	0
159	23	5	71.5	255.0	135.0	42.5	23.0	8.180	3.35	12.90	1.15	106.0	7.0	3.40	3.0	27.05	3.5	0
160	23	6	69.0	207.5	100.0	37.5	20.2	5.695	7.00	0.00	0.00	95.0	8.5	3.90	4.0	43.80	5.5	0
161	23	7	73.0	280.0	140.0	44.0	22.9	9.775	4.70	9.10	0.00	115.5	4.0	1.15	3.0	6.85	3.0	0

CUYUTA 1989 (ENVIRONMENT No. 2)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
1	1	1	53.0	215.0	112.5	34.5	18.7	5.045	8.35	1.60	3.25	77.5	28.0	1.60	2.5	0	0	2
2	1	2	53.5	245.0	117.5	36.5	18.1	6.070	0.00	7.50	0.00	100.5	8.5	4.00	2.0	0	0	2
3	1	3	54.5	262.5	137.5	16.0	18.4	3.480	2.15	0.00	0.00	105.5	0.0	2.15	2.5	0	0	5
4	1	4	55.0	252.5	122.5	42.5	20.2	6.775	10.15	0.00	0.00	94.0	14.5	4.80	2.0	0	0	2
5	1	5	54.0	250.0	140.0	38.5	20.0	6.220	4.30	0.00	0.00	90.0	5.5	7.80	2.5	0	0	2
6	1	6	54.5	250.0	127.5	38.5	19.8	5.480	2.85	0.00	1.35	91.5	7.0	10.20	2.0	0	0	2
7	1	7	52.5	262.5	145.0	37.5	18.7	6.970	4.90	0.00	0.00	101.5	6.5	4.15	2.0	0	0	2
8	2	1	54.0	245.0	130.0	39.0	19.0	5.485	8.10	0.00	1.30	93.5	9.5	6.40	2.0	0	0	3
9	2	2	53.0	230.0	122.5	40.5	18.9	6.420	2.60	0.00	3.70	95.0	4.0	8.50	2.0	0	0	2
10	2	3	53.0	240.0	115.0	38.0	19.6	6.595	6.30	0.00	0.00	103.5	2.0	2.65	2.0	0	0	2
11	2	4	52.0	210.0	110.0	42.0	18.9	6.475	8.85	0.00	1.15	94.0	9.0	5.85	2.5	0	0	2
12	2	5	52.0	245.0	140.0	38.5	19.0	7.040	11.25	0.00	2.60	104.0	1.5	2.60	2.0	0	0	2
13	2	6	52.5	250.0	120.0	40.0	18.6	6.515	6.75	0.00	2.50	96.5	10.0	10.00	2.0	0	0	3
14	2	7	51.5	240.0	120.0	39.5	19.9	6.280	6.35	1.30	2.55	101.0	1.0	3.80	2.0	0	0	3
15	3	1	54.5	250.0	130.0	12.0	18.4	2.490	10.55	0.00	0.00	138.0	17.0	13.55	2.0	0	0	5
16	3	2	53.5	242.5	125.0	39.5	19.6	7.385	5.30	2.50	1.25	96.5	4.5	0.00	2.0	0	0	3
17	3	3	54.5	245.0	122.5	38.5	18.7	6.150	9.90	2.80	0.00	94.5	8.0	1.20	2.0	0	0	3
18	3	4	51.5	245.0	132.5	38.0	19.4	6.945	4.30	0.00	0.00	102.5	7.0	4.15	2.0	0	0	3
19	3	5	54.5	255.0	147.5	38.5	19.3	5.510	1.55	0.00	0.00	85.5	11.0	11.65	2.0	0	0	4
20	3	6	52.0	240.0	137.5	35.5	18.9	5.895	1.40	5.40	0.00	108.0	5.5	6.00	2.5	0	0	2
21	3	7	54.5	225.0	127.5	37.5	18.9	4.705	3.75	1.45	1.45	85.5	21.5	3.95	2.5	0	0	3
22	4	1	53.0	240.0	132.5	36.5	19.1	5.885	5.40	0.00	0.00	100.0	8.0	5.25	2.0	0	0	2
23	4	2	53.5	230.0	120.0	37.5	20.0	5.645	5.40	0.00	0.00	101.5	11.0	12.85	2.0	0	0	2
24	4	3	53.0	232.5	110.0	40.0	18.6	6.500	11.85	0.00	2.45	95.0	4.0	8.60	2.5	0	0	2
25	4	4	54.0	242.5	132.5	37.5	19.3	5.755	6.60	1.45	0.00	94.5	4.0	10.90	2.0	0	0	3
26	4	5	54.5	250.0	135.0	38.5	18.4	5.935	5.65	3.85	1.30	92.0	6.0	6.55	2.0	0	0	2
27	4	6	54.0	237.5	127.5	32.0	19.2	5.365	6.60	0.00	0.00	101.0	12.0	6.90	2.0	0	0	2
28	4	7	53.5	235.0	127.5	36.0	19.5	5.565	4.30	1.60	2.80	95.0	12.5	5.70	2.0	0	0	3
29	5	1	54.0	250.0	132.5	39.0	19.2	6.850	6.95	5.15	0.00	96.5	9.5	2.55	2.0	0	0	2
30	5	2	53.0	252.5	147.5	36.5	18.9	6.705	2.95	5.15	0.00	105.0	6.0	5.10	2.0	0	0	4
31	5	3	53.0	247.5	130.0	30.0	19.6	5.715	5.75	0.00	2.40	109.5	7.5	3.85	2.0	0	0	3
32	5	4	53.0	245.0	132.5	34.5	18.7	6.090	13.80	2.55	0.00	93.5	12.0	9.20	2.0	0	0	2
33	5	5	51.5	242.5	127.5	36.5	18.7	6.020	4.45	6.85	1.65	100.5	8.0	10.15	2.0	0	0	2
34	5	6	52.0	242.5	125.0	38.0	19.6	6.190	2.85	6.90	0.00	102.0	8.5	4.20	2.0	0	0	3
35	5	7	52.5	242.5	117.5	39.0	18.3	6.230	7.90	0.00	0.00	98.0	8.0	2.60	2.0	0	0	3
36	6	1	54.5	257.5	135.0	37.5	19.9	6.110	14.65	0.00	0.00	101.0	8.0	8.10	2.0	0	0	3
37	6	2	52.5	255.0	130.0	38.0	19.3	6.210	6.85	2.65	2.65	96.0	11.0	5.30	2.0	0	0	3
38	6	3	52.5	240.0	140.0	34.5	20.1	5.975	11.15	3.35	0.00	89.0	13.5	3.35	2.0	0	0	3
39	6	4	53.0	235.0	122.5	32.5	20.3	5.510	4.50	0.00	0.00	100.0	3.0	7.95	2.0	0	0	3
40	6	5	53.0	245.0	130.0	37.5	20.5	6.015	17.40	0.00	1.25	100.5	12.0	10.90	2.0	0	0	3

CUYUTA 1989 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
41	6	6	51.5	247.5	142.5	39.5	19.5	6.255	6.50	0.00	0.00	98.0	7.0	5.10	2.0	0	0	3
42	6	7	52.5	240.0	120.0	33.5	20.3	4.940	19.40	0.00	0.00	92.5	11.5	9.00	2.0	0	0	3
43	7	1	51.5	245.0	127.5	40.5	19.3	6.840	4.95	4.90	0.00	101.0	11.0	0.00	2.0	0	0	2
44	7	2	53.0	252.5	137.5	42.0	18.8	6.135	6.70	13.95	3.65	89.0	13.0	4.80	2.5	0	0	3
45	7	3	54.0	255.0	125.0	43.0	19.2	7.365	3.40	2.35	1.15	106.0	9.0	5.85	2.5	0	0	2
46	7	4	53.5	252.5	135.0	42.0	20.1	6.265	2.55	2.40	0.00	99.0	10.5	3.60	2.5	0	0	2
47	7	5	53.0	255.0	142.5	42.0	18.8	6.365	4.80	11.35	2.25	100.5	12.0	2.40	2.5	0	0	4
48	7	6	52.0	245.0	135.0	41.5	19.0	5.775	6.30	8.25	1.25	99.0	9.5	3.50	2.0	0	0	3
49	7	7	53.5	245.0	137.5	41.5	20.4	5.410	5.65	23.95	1.20	89.5	14.5	6.05	2.5	0	0	3
50	8	1	52.5	235.0	117.5	30.5	19.3	5.735	2.15	0.00	2.25	113.0	8.5	5.85	2.0	0	0	3
51	8	2	54.0	245.0	117.5	37.0	19.5	6.665	4.10	7.90	0.00	97.0	0.0	2.80	2.0	0	0	3
52	8	3	53.5	235.0	117.5	37.5	19.0	5.895	9.45	0.00	0.00	98.5	3.0	5.35	2.0	0	0	2
53	8	4	53.0	240.0	122.5	34.5	19.1	5.770	9.05	0.00	1.35	97.0	4.0	10.30	2.5	0	0	3
54	8	5	52.5	245.0	130.0	37.0	19.2	6.390	7.70	7.30	1.50	105.5	5.5	3.05	2.0	0	0	2
55	8	6	54.0	235.0	117.5	36.0	20.1	6.670	4.90	0.00	0.00	110.5	1.5	5.25	2.0	0	0	3
56	8	7	53.0	235.0	132.5	34.0	19.0	6.005	7.25	1.60	1.60	103.0	3.0	10.50	2.5	0	0	2
57	9	1	52.5	240.0	115.0	32.5	19.4	5.100	6.40	0.00	1.50	97.0	11.0	4.70	2.5	0	0	2
58	9	2	53.5	250.0	127.5	38.5	18.9	6.235	2.95	0.00	2.60	92.0	6.0	2.65	2.0	0	0	3
59	9	3	54.5	235.0	132.5	39.5	19.6	5.320	9.55	3.65	0.00	91.0	12.0	7.60	2.0	0	0	2
60	9	4	53.0	245.0	132.5	41.5	20.4	5.725	8.25	0.00	1.15	89.5	13.5	7.05	2.5	0	0	2
61	9	5	53.0	242.5	120.0	39.5	19.3	6.380	5.35	0.00	0.00	94.0	4.0	3.75	2.0	0	0	2
62	9	6	55.0	255.0	147.5	39.5	19.2	6.515	1.40	10.80	1.35	98.5	4.0	2.55	2.0	0	0	2
63	9	7	54.5	260.0	147.5	41.0	18.5	5.920	8.05	23.85	0.00	104.0	8.0	3.65	2.0	0	0	3
64	10	1	53.5	250.0	135.0	43.5	20.8	7.215	4.55	0.00	0.00	101.5	3.0	1.10	2.0	0	0	2
65	10	2	54.5	237.5	117.5	37.5	19.9	5.770	10.60	1.30	1.40	90.5	3.0	5.35	2.0	0	0	3
66	10	3	53.5	252.5	142.5	38.0	19.4	5.290	2.70	0.00	2.65	97.0	12.0	3.95	2.0	0	0	2
67	10	4	55.5	242.5	120.0	39.5	19.1	5.890	5.25	2.45	0.00	102.5	6.5	5.10	2.0	0	0	3
68	10	5	55.0	242.5	137.5	37.5	18.7	5.730	11.60	0.00	2.95	103.5	12.5	5.60	2.0	0	0	3
69	10	6	54.0	250.0	137.5	37.0	18.4	6.570	8.20	0.00	3.15	101.0	6.5	5.10	2.0	0	0	3
70	10	7	54.0	237.5	127.5	36.0	20.0	5.930	5.75	0.00	0.00	97.5	7.0	9.75	2.0	0	0	2
71	11	1	55.0	245.0	132.5	35.0	19.5	5.280	13.35	0.00	0.00	97.5	9.0	11.60	2.0	0	0	2
72	11	2	53.5	240.0	130.0	35.5	19.7	5.725	15.00	0.00	0.00	98.0	10.5	5.70	2.0	0	0	2
73	11	3	53.5	250.0	122.5	35.5	19.0	6.070	12.90	2.50	0.00	96.0	8.5	9.85	2.0	0	0	2
74	11	4	54.5	235.0	137.5	36.0	18.4	6.285	10.70	0.00	1.15	101.0	5.5	4.05	2.0	0	0	3
75	11	5	54.5	245.0	140.0	37.5	17.8	6.390	9.40	0.00	1.45	100.5	5.5	3.95	2.5	0	0	3
76	11	6	54.0	257.5	147.5	36.5	19.7	5.725	8.40	7.00	2.80	101.0	4.5	4.00	2.0	0	0	3
77	11	7	53.0	250.0	157.5	37.0	18.4	6.755	8.95	0.00	1.35	104.0	13.0	1.35	2.0	0	0	3
78	12	1	50.0	235.0	122.5	40.5	20.2	5.235	15.50	4.55	0.00	95.5	20.5	8.40	2.0	0	0	2
79	12	2	51.5	235.0	127.5	45.5	18.7	5.220	10.55	6.25	0.00	82.0	1.5	8.15	2.0	0	0	2
80	12	3	52.5	245.0	130.0	40.5	20.4	6.645	8.60	3.70	1.20	98.5	2.5	3.70	2.0	0	0	3

CUYUTA 1989 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
81	12	4	50.5	232.5	120.0	38.0	20.0	6.280	5.05	4.75	2.95	105.0	6.5	4.75	2.0	0	0	3
82	12	5	51.5	250.0	130.0	44.5	17.7	6.385	9.75	8.90	0.00	92.0	4.5	10.10	2.5	0	0	2
83	12	6	50.5	230.0	120.0	42.0	18.7	5.625	14.55	4.90	0.00	91.5	7.5	7.15	2.0	0	0	2
84	12	7	51.0	237.5	125.0	39.0	17.9	6.330	5.65	2.40	0.00	94.5	7.5	5.20	2.0	0	0	2
85	13	1	52.5	237.5	120.0	33.5	20.0	5.815	7.60	0.00	0.00	97.5	7.5	2.55	2.5	0	0	3
86	13	2	52.0	235.0	130.0	36.0	20.0	6.045	13.95	0.00	0.00	100.0	11.5	3.50	2.0	0	0	2
87	13	3	51.5	225.0	117.5	37.0	20.9	5.920	5.35	2.95	1.25	102.0	13.0	8.15	2.0	0	0	2
88	13	4	52.5	225.0	102.5	30.0	20.0	5.080	10.00	0.00	0.00	100.5	3.0	6.70	2.0	0	0	2
89	13	5	52.5	232.5	127.5	32.0	19.2	5.640	9.85	0.00	1.70	105.0	8.0	6.00	2.0	0	0	3
90	13	6	52.5	222.5	112.5	31.0	20.0	5.300	4.85	0.00	1.65	101.5	8.0	9.45	2.0	0	0	2
91	13	7	50.5	235.0	137.5	32.5	19.0	5.485	3.55	0.00	0.00	94.5	6.5	10.75	2.0	0	0	3
92	14	1	52.0	237.5	132.5	38.5	19.8	6.345	9.00	0.00	0.00	87.0	7.5	6.55	2.0	0	0	3
93	14	2	53.0	235.0	120.0	40.0	19.7	6.855	8.65	0.00	0.00	101.5	0.0	5.05	2.0	0	0	2
94	14	3	53.0	245.0	135.0	40.0	19.7	6.520	7.75	0.00	1.30	112.5	9.0	7.80	2.5	0	0	3
95	14	4	52.0	240.0	127.5	37.0	20.0	5.935	2.55	0.00	4.30	105.5	11.5	10.70	2.0	0	0	3
96	14	5	52.0	240.0	120.0	42.5	19.7	7.030	11.85	0.00	3.55	100.0	4.5	4.70	2.0	0	0	2
97	14	6	54.0	240.0	140.0	26.5	18.8	4.520	14.85	0.00	0.00	99.0	1.0	3.55	2.0	0	0	3
98	14	7	54.0	237.5	127.5	36.5	19.6	5.960	2.80	0.00	0.00	100.0	3.0	6.90	2.0	0	0	3
99	15	1	54.5	245.0	127.5	35.0	19.4	5.860	2.90	2.55	2.55	100.0	0.0	1.60	2.0	0	0	3
100	15	2	53.0	240.0	127.5	37.0	19.7	6.005	2.80	0.00	1.30	95.5	8.5	4.15	2.0	0	0	3
101	15	3	55.0	240.0	130.0	38.5	19.3	6.160	8.10	2.35	0.00	98.0	9.5	1.15	2.0	0	0	2
102	15	4	54.0	240.0	120.0	39.5	21.1	6.740	3.75	0.00	0.00	100.0	12.0	4.90	2.0	0	0	3
103	15	5	55.5	245.0	142.5	38.0	20.1	6.320	1.45	0.00	0.00	108.5	7.5	3.90	2.0	0	0	2
104	15	6	53.0	247.5	135.0	33.5	20.3	5.675	6.05	0.00	0.00	108.5	9.5	4.75	2.0	0	0	3
105	15	7	55.0	245.0	130.0	37.5	19.1	6.335	5.70	0.00	1.35	96.0	5.5	4.00	2.0	0	0	2
106	16	1	52.0	240.0	130.0	39.5	20.3	5.625	5.50	2.45	0.00	92.5	2.5	8.75	3.5	0	0	5
107	16	2	52.0	225.0	122.5	38.5	18.8	5.845	6.90	0.00	2.65	93.5	12.5	9.10	2.5	0	0	4
108	16	3	52.5	250.0	152.5	41.0	20.0	6.325	10.35	0.00	0.00	94.0	9.5	2.45	3.5	0	0	4
109	16	4	53.0	245.0	125.0	35.0	19.9	5.590	7.00	0.00	0.00	101.5	6.0	5.70	2.0	0	0	4
110	16	5	54.5	245.0	135.0	32.0	20.1	4.565	12.50	2.15	0.00	101.5	8.0	10.70	2.5	0	0	3
111	16	6	52.0	240.0	137.5	38.0	19.3	5.985	1.15	5.15	1.30	105.5	11.0	5.35	2.5	0	0	4
112	16	7	53.5	245.0	142.5	41.0	19.6	5.555	10.80	0.00	0.00	90.0	13.5	6.10	2.5	0	0	3
113	17	1	52.0	262.5	142.5	32.5	19.4	5.920	4.80	1.65	0.00	100.0	6.0	4.30	2.0	0	0	3
114	17	2	52.0	255.0	140.0	38.5	19.3	6.740	3.95	2.40	0.00	92.0	3.0	3.85	2.0	0	0	1
115	17	3	52.0	255.0	145.0	38.5	19.4	7.525	5.15	0.00	0.00	105.0	0.0	2.45	2.0	0	0	2
116	17	4	52.0	247.5	132.5	35.5	19.4	5.565	3.00	3.70	0.00	98.0	5.0	4.55	2.0	0	0	2
117	17	5	51.5	260.0	137.5	39.0	18.8	6.770	1.20	0.00	0.00	96.0	4.0	2.50	2.0	0	0	2
118	17	6	53.5	237.5	122.5	33.5	20.0	5.190	3.40	0.00	1.25	92.0	12.5	11.75	2.0	0	0	2
119	17	7	54.0	260.0	155.0	33.5	19.6	5.790	4.35	0.00	0.00	95.5	7.0	4.45	2.0	0	0	2
120	18	1	53.0	257.5	142.5	37.5	20.0	6.910	15.25	2.55	2.70	96.0	5.5	2.70	2.0	0	0	2

CUYUTA 1989 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
121	18	2	55.5	260.0	130.0	38.5	19.5	5.965	14.30	0.00	0.00	91.0	8.5	5.15	2.0	0	0	2
122	18	3	54.5	255.0	125.0	25.0	18.9	5.090	9.70	0.00	0.00	102.0	4.0	0.00	2.0	0	0	2
123	18	4	54.0	250.0	127.5	32.0	19.8	5.970	13.30	2.55	0.00	108.0	6.5	7.85	2.0	0	0	2
124	18	5	53.5	250.0	137.5	38.5	21.1	7.260	4.05	0.00	1.30	98.5	5.0	1.30	2.0	0	0	2
125	18	6	53.5	250.0	137.5	35.0	19.3	6.725	2.65	0.00	0.00	108.5	6.5	1.40	2.0	0	0	2
126	18	7	53.5	230.0	122.5	38.0	20.9	6.595	11.85	1.35	0.00	98.5	10.5	5.20	2.0	0	0	2
127	19	1	52.5	230.0	120.0	36.5	19.5	5.395	7.90	1.40	0.00	91.0	9.5	6.85	2.5	0	0	3
128	19	2	51.5	245.0	152.5	33.5	20.2	6.085	8.55	0.00	0.00	103.0	8.5	3.00	2.5	0	0	3
129	19	3	53.0	245.0	130.0	36.0	19.2	5.755	8.15	0.00	0.00	101.5	12.5	5.50	2.5	0	0	4
130	19	4	53.0	240.0	142.5	41.5	20.8	6.160	6.15	0.00	0.00	98.0	2.5	5.95	2.5	0	0	2
131	19	5	52.5	232.5	125.0	39.5	18.6	5.285	1.35	2.55	0.00	92.5	12.5	7.55	3.0	0	0	4
132	19	6	52.5	240.0	132.5	38.5	19.4	5.630	10.90	0.00	0.00	96.0	5.5	3.95	2.0	0	0	3
133	19	7	52.0	230.0	125.0	40.0	18.4	6.115	4.10	0.00	0.00	93.5	9.5	5.05	2.0	0	0	3
134	20	1	52.5	235.0	130.0	41.5	19.1	6.285	4.80	3.55	2.40	101.0	14.5	2.40	2.5	0	0	2
135	20	2	53.5	247.5	132.5	39.0	19.9	6.850	6.10	10.80	1.20	89.0	15.5	3.65	2.5	0	0	3
136	20	3	52.0	245.0	140.0	40.0	18.8	6.025	6.40	2.45	1.20	97.0	12.5	6.35	2.5	0	0	3
137	20	4	52.5	242.5	130.0	38.0	19.8	6.175	2.80	0.00	2.65	105.0	8.5	2.65	2.0	0	0	2
138	20	5	52.0	245.0	140.0	39.5	18.9	6.510	1.10	2.45	7.80	98.5	8.0	3.85	2.5	0	0	3
139	20	6	52.0	252.5	132.5	40.5	19.7	7.100	2.85	7.55	1.20	86.5	3.0	1.30	2.5	0	0	3
140	20	7	52.0	245.0	137.5	38.5	20.1	6.780	1.30	0.00	4.15	100.5	9.5	0.00	2.0	0	0	3
141	21	1	52.0	250.0	137.5	36.0	17.8	6.215	5.15	7.15	2.40	95.0	2.5	7.85	2.5	0	0	5
142	21	2	52.0	242.5	122.5	37.5	18.6	6.380	2.90	2.65	1.35	92.0	1.5	0.00	2.0	0	0	2
143	21	3	51.5	235.0	120.0	35.0	18.8	6.075	7.55	1.30	0.00	100.0	4.0	4.20	2.0	0	0	2
144	21	4	52.5	237.5	122.5	38.5	19.4	5.845	4.05	0.00	0.00	96.5	8.5	8.95	2.0	0	0	2
145	21	5	53.0	247.5	135.0	38.5	19.4	6.550	4.55	1.30	0.00	92.0	4.5	1.30	2.5	0	0	3
146	21	6	52.0	247.5	140.0	37.0	19.0	6.060	2.90	0.00	0.00	95.5	8.0	6.80	2.0	0	0	2
147	21	7	52.5	237.5	115.0	39.0	19.3	5.580	4.00	0.00	2.55	93.0	6.0	7.45	2.0	0	0	3
148	22	1	53.5	240.0	125.0	32.5	19.8	5.655	2.00	0.00	0.00	98.0	1.5	2.55	2.0	0	0	2
149	22	2	52.5	235.0	117.5	40.5	19.6	6.820	1.20	0.00	0.00	98.5	0.0	1.30	2.0	0	0	2
150	22	3	54.5	240.0	122.5	38.0	20.3	5.675	8.20	2.70	0.00	96.0	4.0	6.60	2.0	0	0	2
151	22	4	54.0	245.0	125.0	34.0	19.8	6.180	5.75	0.00	3.15	104.5	10.0	4.55	2.0	0	0	2
152	22	5	51.0	242.5	132.5	40.0	19.4	7.015	5.30	0.00	0.00	95.0	8.0	3.75	2.0	0	0	2
153	22	6	51.5	245.0	120.0	36.5	19.3	6.495	4.25	2.95	1.45	98.5	4.5	2.95	2.0	0	0	2
154	22	7	51.0	230.0	125.0	37.5	19.9	6.790	5.20	0.00	0.00	96.0	3.5	2.70	2.0	0	0	2
155	23	1	54.0	230.0	117.5	36.0	19.3	6.100	9.30	1.30	1.30	104.5	3.0	5.60	2.0	0	0	3
156	23	2	54.0	227.5	127.5	35.0	19.9	5.310	1.40	2.80	1.45	95.5	3.0	2.80	2.0	0	0	3
157	23	3	55.0	240.0	122.5	35.5	19.5	4.935	2.45	0.00	1.60	103.0	8.0	3.25	3.5	0	0	5
158	23	4	55.0	242.5	125.0	34.5	18.9	5.660	4.30	0.00	4.05	103.0	3.0	5.60	2.0	0	0	3
159	23	5	54.5	245.0	115.0	35.0	19.0	5.830	2.80	2.80	0.00	107.5	13.5	4.40	2.0	0	0	3
160	23	6	55.0	232.5	112.5	20.5	19.8	3.765	18.25	0.00	3.35	103.5	8.5	3.35	2.0	0	0	2
161	23	7	54.5	245.0	127.5	36.0	20.0	5.530	5.25	4.15	1.40	101.5	11.0	5.55	2.0	0	0	3

LA MAQUINA 1989 (ENVIRONMENT No. 3)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
1	1	1	55.0	237.5	155.0	35.5	16.9	1.420	2.15	0.00	0.00	63.5	51.0	0.00	2.0	0	0	3
2	1	2	55.5	230.0	137.5	44.0	17.1	1.890	0.00	0.00	1.15	61.5	47.5	0.00	2.5	0	0	3
3	1	3	58.0	245.0	140.0	43.5	16.6	0.415	0.00	0.00	0.00	27.5	81.5	0.00	2.0	0	0	4
4	1	4	56.5	250.0	155.0	43.5	16.8	1.065	0.00	0.00	0.00	57.0	75.0	0.00	2.5	0	0	3
5	1	5	53.5	245.0	155.0	44.0	16.7	2.315	0.00	0.00	0.00	77.5	45.5	0.00	2.0	0	0	4
6	1	6	57.0	207.5	130.0	41.5	16.6	1.420	2.25	0.00	1.25	56.5	69.0	0.00	2.5	0	0	4
7	1	7	56.0	237.5	150.0	44.0	16.7	1.485	1.55	0.00	0.00	68.5	92.0	0.00	2.0	0	0	3
8	2	1	52.0	237.5	127.5	42.5	16.7	1.545	6.50	0.00	0.00	52.5	75.0	0.00	2.0	0	0	3
9	2	2	52.0	240.0	147.5	40.0	17.7	1.995	0.00	1.20	0.00	76.5	85.5	0.00	2.0	0	0	3
10	2	3	52.5	230.0	125.0	40.0	16.5	1.485	5.35	0.00	0.00	72.5	81.0	0.00	2.0	0	0	3
11	2	4	53.0	245.0	145.0	41.5	17.2	1.830	1.80	0.00	0.00	64.0	56.5	0.00	2.0	0	0	3
12	2	5	53.0	260.0	157.5	42.5	17.6	2.055	1.60	0.00	0.00	70.5	88.5	0.00	2.5	0	0	4
13	2	6	52.5	230.0	122.5	39.5	16.8	2.130	3.65	1.40	0.00	70.5	43.5	0.00	2.5	0	0	3
14	3	7	51.5	235.0	130.0	41.0	17.2	2.480	3.25	0.00	0.00	72.0	53.0	0.00	2.0	0	0	3
15	3	1	52.5	247.5	135.0	42.5	16.3	1.370	14.25	0.00	0.00	58.0	59.5	0.00	2.0	0	0	3
16	3	2	51.0	245.0	142.5	43.0	16.0	1.795	8.25	0.00	0.00	70.5	66.0	0.00	2.5	0	0	4
17	3	3	52.5	235.0	147.5	44.0	17.0	1.180	8.15	0.00	0.00	44.5	79.5	0.00	2.5	0	0	4
18	3	4	52.0	245.0	155.0	43.0	16.6	1.845	5.20	1.15	0.00	70.0	41.5	0.00	2.0	0	0	4
19	3	5	52.0	232.5	145.0	42.5	16.2	1.730	1.80	2.25	0.00	65.0	67.5	0.00	2.5	0	0	5
20	3	6	51.0	222.5	130.0	43.5	16.6	1.905	7.15	3.50	0.00	66.5	47.0	0.00	3.0	0	0	3
21	3	7	51.5	212.5	117.5	43.0	16.4	2.090	1.70	0.00	0.00	76.5	63.0	0.00	2.0	0	0	3
22	4	1	57.0	232.5	140.0	43.0	16.3	1.060	4.00	0.00	0.00	45.0	80.0	0.00	2.0	0	0	3
23	4	2	54.0	245.0	142.5	43.5	16.7	1.540	3.55	0.00	0.00	69.0	77.5	0.00	2.0	0	0	3
24	4	3	56.5	215.0	135.0	42.0	16.8	0.825	5.90	0.00	0.00	34.5	78.5	0.00	2.5	0	0	3
25	4	4	57.5	232.5	137.5	44.0	16.7	1.305	6.55	0.00	0.00	51.5	84.0	0.00	2.5	0	0	3
26	4	5	54.5	240.0	137.5	44.0	16.9	1.420	2.15	0.00	0.00	46.5	87.0	0.00	3.0	0	0	5
27	4	6	55.5	220.0	135.0	42.0	17.1	1.770	7.40	0.00	0.00	64.0	68.5	1.20	2.0	0	0	4
28	4	7	55.0	222.5	130.0	33.5	17.1	1.300	6.05	0.00	1.80	71.5	92.0	0.00	2.0	0	0	3
29	5	1	53.0	232.5	122.5	44.0	16.4	2.200	3.25	1.15	0.00	71.5	47.0	0.00	2.0	0	0	3
30	5	2	52.0	217.5	120.0	44.0	17.6	2.585	0.00	0.00	0.00	76.5	67.0	0.00	2.0	0	0	4
31	5	3	53.0	220.0	117.5	44.0	17.0	1.835	0.00	0.00	0.00	72.5	36.5	0.00	2.5	0	0	4
32	5	4	53.0	237.5	145.0	43.0	17.1	2.245	7.05	0.00	0.00	70.0	48.5	0.00	2.0	0	0	3
33	5	5	52.5	212.5	110.0	43.0	16.6	2.380	1.70	0.00	0.00	74.5	64.5	0.00	2.0	0	0	5
34	5	6	53.0	227.5	132.5	43.5	16.8	3.020	0.00	0.00	0.00	79.0	33.0	0.00	2.5	0	0	4
35	5	7	54.5	220.0	115.0	43.0	16.3	1.425	0.00	0.00	0.00	62.0	57.5	1.20	1.0	0	0	3
36	6	1	50.5	232.5	125.0	43.0	15.8	1.560	1.80	0.00	0.00	75.5	75.0	1.15	2.5	0	0	4
37	6	2	51.0	225.0	125.0	41.5	16.8	1.600	0.00	0.00	0.00	84.0	56.0	3.50	2.5	0	0	4
38	6	3	52.5	220.0	135.0	44.0	16.2	0.895	2.50	0.00	1.10	48.5	74.5	0.00	2.0	0	0	4
39	6	4	51.5	232.5	145.0	44.0	15.9	0.955	0.00	0.00	0.00	62.5	73.5	0.00	2.5	0	0	3
40	6	5	49.5	232.5	137.5	41.0	16.5	1.365	0.00	0.00	0.00	59.5	68.0	0.00	2.5	0	0	5

LA MAQUINA 1989 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
41	6	6	50.0	205.0	120.0	43.0	16.6	1.780	0.00	2.40	0.00	74.5	50.5	0.00	2.5	0	0	3
42	6	7	51.0	207.5	120.0	43.0	16.0	1.850	0.00	1.15	1.15	58.5	66.5	0.00	2.5	0	0	4
43	7	1	53.5	222.5	142.5	44.0	16.0	1.200	6.85	0.00	0.00	67.0	89.0	1.15	2.0	0	0	3
44	7	2	52.0	217.5	125.0	44.0	16.0	1.980	0.00	0.00	0.00	69.0	72.0	0.00	2.5	0	0	4
45	7	3	53.5	217.5	140.0	43.5	16.2	1.375	1.45	0.00	0.00	73.5	62.0	0.00	2.0	0	0	4
46	7	4	52.5	202.5	125.0	43.5	16.1	1.200	4.00	0.00	0.00	54.0	64.0	0.00	2.5	0	0	4
47	7	5	52.5	215.0	127.5	43.0	15.9	1.860	4.45	0.00	0.00	76.5	72.0	1.15	3.0	0	0	5
48	7	6	53.5	205.0	127.5	43.0	15.9	1.800	0.00	0.00	0.00	66.0	59.5	1.15	2.5	0	0	4
49	7	7	51.5	207.5	127.5	43.5	15.3	1.930	3.25	0.00	0.00	71.0	87.5	0.00	2.0	0	0	4
50	8	1	54.0	215.0	117.5	43.5	16.3	1.490	3.85	0.00	0.00	56.0	70.5	0.00	2.0	0	0	3
51	8	2	53.0	215.0	130.0	44.0	16.8	1.835	0.00	0.00	0.00	70.5	90.5	0.00	2.0	0	0	3
52	8	3	53.0	212.5	120.0	43.5	16.5	1.070	0.00	0.00	0.00	64.0	79.5	0.00	2.0	0	0	4
53	8	4	53.0	217.5	122.5	44.0	16.2	1.490	2.80	0.00	0.00	59.0	69.5	0.00	2.0	0	0	3
54	8	5	53.0	215.0	130.0	44.0	16.5	1.605	0.00	0.00	0.00	53.0	41.5	0.00	2.0	0	0	3
55	8	6	53.0	210.0	115.0	43.0	16.9	1.720	0.00	0.00	0.00	62.5	57.0	0.00	2.0	0	0	3
56	8	7	53.0	195.0	110.0	44.0	16.7	1.720	0.00	0.00	0.00	71.5	84.0	1.15	2.0	0	0	3
57	9	1	57.0	242.5	130.0	43.5	15.7	0.900	5.25	0.00	0.00	46.0	81.5	0.00	2.5	0	0	4
58	9	2	54.5	237.5	142.5	43.5	16.6	1.605	0.00	0.00	0.00	65.5	95.0	1.15	2.5	0	0	4
59	9	3	57.0	232.5	127.5	43.0	15.8	0.420	18.70	0.00	0.00	23.0	92.5	0.00	2.0	0	0	4
60	9	4	57.5	220.0	135.0	44.0	16.2	0.945	3.15	0.00	0.00	43.0	82.0	0.00	2.0	0	0	3
61	9	5	54.0	232.5	152.5	44.0	16.9	2.655	4.15	0.00	0.00	72.0	31.5	0.00	2.0	0	0	4
62	9	6	55.5	220.0	135.0	44.0	16.0	1.730	5.65	0.00	1.15	59.0	81.0	2.25	2.0	0	0	4
63	9	7	57.5	200.0	110.0	42.5	16.3	0.950	4.35	0.00	0.00	52.5	87.0	0.00	2.0	0	0	4
64	10	1	52.5	240.0	137.5	42.5	16.5	2.860	1.70	2.45	0.00	77.0	49.5	0.00	2.0	0	0	3
65	10	2	52.0	242.5	135.0	43.5	16.8	2.605	0.00	0.00	0.00	69.0	75.5	0.00	2.0	0	0	3
66	10	3	52.5	237.5	132.5	43.5	16.2	2.385	0.00	0.00	0.00	67.5	36.0	0.00	2.0	0	0	3
67	10	4	53.0	235.0	140.0	42.5	16.3	3.215	0.00	0.00	0.00	87.0	22.5	0.00	2.0	0	0	3
68	10	5	52.5	257.5	155.0	43.0	16.4	3.035	0.00	0.00	0.00	90.5	44.5	0.00	2.0	0	0	3
69	10	6	52.5	220.0	112.5	44.5	16.4	3.035	2.65	0.00	0.00	82.0	42.0	0.00	2.0	0	0	3
70	10	7	52.0	230.0	130.0	42.0	16.8	3.260	0.00	0.00	0.00	89.0	43.5	0.00	2.0	0	0	3
71	11	1	53.0	240.0	160.0	44.0	16.2	1.495	0.00	0.00	0.00	59.5	66.5	0.00	2.0	0	0	3
72	11	2	50.0	245.0	150.0	43.5	16.9	3.025	0.00	2.25	0.00	87.5	20.5	0.00	2.5	0	0	4
73	11	3	52.0	225.0	127.5	43.0	16.2	1.555	0.00	0.00	0.00	67.5	49.5	0.00	3.0	0	0	3
74	11	4	52.5	240.0	140.0	43.0	17.1	2.125	0.00	0.00	0.00	81.5	31.5	0.00	2.0	0	0	3
75	11	5	51.5	267.5	165.0	44.5	16.8	2.315	1.60	2.25	0.00	79.5	47.0	0.00	2.0	0	0	3
76	11	6	51.0	255.0	135.0	44.0	16.2	2.925	0.00	2.25	0.00	83.0	21.5	0.00	2.0	0	0	3
77	11	7	52.0	217.5	137.5	43.5	16.2	2.860	0.00	0.00	0.00	80.5	58.5	0.00	2.0	0	0	3
78	12	1	53.5	242.5	140.0	44.0	16.1	1.850	1.90	0.00	0.00	68.0	64.0	0.00	2.0	0	0	3
79	12	2	51.5	247.5	145.0	43.0	16.8	2.485	0.00	0.00	0.00	79.0	68.5	0.00	2.0	0	0	3
80	12	3	52.5	240.0	140.0	43.5	17.1	1.550	1.85	0.00	0.00	53.0	44.5	0.00	2.0	0	0	3

LA MAQUINA 1989 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
81	12	4	53.0	235.0	135.0	32.5	16.6	1.845	0.00	0.00	0.00	66.5	46.5	0.00	2.0	0	0	3
82	12	5	51.0	265.0	167.5	44.0	16.4	2.320	0.00	0.00	0.00	79.5	34.0	0.00	2.5	0	0	3
83	12	6	51.5	235.0	137.5	44.0	16.2	2.740	0.00	0.00	0.00	80.5	29.5	0.00	2.0	0	0	3
84	12	7	52.5	240.0	150.0	44.0	16.5	2.680	0.00	0.00	0.00	87.5	43.5	0.00	2.0	0	0	3
85	13	1	55.0	232.5	152.5	43.5	16.4	1.725	1.50	0.00	0.00	60.0	49.5	0.00	2.0	0	0	3
86	13	2	51.5	222.5	140.0	37.5	16.2	1.730	1.85	0.00	0.00	75.0	62.0	1.45	2.0	0	0	3
87	13	3	52.5	220.0	130.0	34.5	16.3	1.195	3.15	0.00	0.00	50.5	58.0	0.00	2.0	0	0	3
88	13	4	53.5	222.5	150.0	42.0	16.8	2.490	1.35	0.00	1.15	88.0	51.5	0.00	2.0	0	0	3
89	13	5	54.0	227.5	142.5	44.0	17.0	2.075	0.00	0.00	0.00	67.5	64.5	0.00	2.0	0	0	3
90	13	6	54.0	217.5	130.0	40.5	16.0	1.740	5.00	0.00	0.00	66.0	78.0	0.00	2.0	0	0	3
91	13	7	53.5	210.0	130.0	42.5	16.8	2.195	0.00	0.00	0.00	71.5	46.0	0.00	2.5	0	0	3
92	14	1	54.5	220.0	132.5	42.0	15.7	2.640	0.00	0.00	0.00	81.0	36.0	0.00	2.0	0	0	2
93	14	2	54.0	212.5	142.5	44.0	16.8	2.490	0.00	0.00	0.00	76.0	68.5	0.00	2.0	0	0	3
94	14	3	54.0	207.5	125.0	44.0	16.2	1.845	0.00	0.00	0.00	63.5	48.5	0.00	2.0	0	0	4
95	14	4	53.5	235.0	150.0	44.0	16.7	2.320	1.40	0.00	0.00	78.5	36.5	0.00	2.0	0	0	3
96	14	5	53.0	252.5	170.0	43.0	16.6	2.860	0.00	0.00	0.00	82.0	37.0	0.00	2.0	0	0	3
97	14	6	53.0	225.0	132.5	43.0	16.9	2.720	0.00	0.00	0.00	73.0	35.0	0.00	2.0	0	0	3
98	14	7	53.0	210.0	132.5	43.0	16.5	2.500	4.00	0.00	1.20	87.0	60.0	0.00	2.0	0	0	3
99	15	1	53.0	240.0	147.5	43.5	16.7	2.605	3.85	0.00	0.00	75.5	65.5	0.00	2.0	0	0	2
100	15	2	51.0	240.0	142.5	43.0	16.2	2.810	0.00	0.00	0.00	78.0	30.0	0.00	2.0	0	0	3
101	15	3	53.0	245.0	132.5	44.0	16.5	2.080	5.15	0.00	0.00	65.0	41.0	0.00	2.0	0	0	3
102	15	4	52.5	252.5	150.0	43.5	16.0	3.115	0.00	0.00	0.00	89.5	42.5	0.00	2.5	0	0	4
103	15	5	52.0	265.0	160.0	44.0	16.5	3.155	0.00	0.00	0.00	86.5	36.5	0.00	2.0	0	0	3
104	15	6	51.5	232.5	125.0	42.5	16.6	3.685	0.00	0.00	0.00	95.5	17.0	0.00	2.0	0	0	4
105	15	7	52.0	247.5	147.5	44.5	16.5	2.735	0.00	0.00	0.00	79.5	39.0	0.00	2.0	0	0	2
106	16	1	55.0	232.5	135.0	44.0	16.7	1.720	4.00	0.00	1.15	62.5	66.5	1.15	2.5	0	0	3
107	16	2	54.0	225.0	135.0	42.5	16.7	1.895	0.00	0.00	0.00	67.0	83.5	0.00	2.5	0	0	4
108	16	3	54.0	200.0	147.5	43.5	16.6	1.420	9.50	0.00	0.00	56.5	63.5	0.00	2.5	0	0	4
109	16	4	54.0	225.0	135.0	43.5	16.2	1.490	10.65	0.00	0.00	55.0	71.0	0.00	2.5	0	0	4
110	16	5	52.5	230.0	140.0	41.5	17.1	1.945	0.00	0.00	0.00	68.0	70.5	0.00	2.5	0	0	5
111	16	6	51.5	215.0	122.5	44.0	16.8	2.130	0.00	0.00	0.00	66.0	71.0	0.00	2.5	0	0	5
112	16	7	53.0	215.0	122.5	43.5	17.3	1.700	0.00	0.00	0.00	71.0	97.5	0.00	2.0	0	0	3
113	17	1	54.5	235.0	140.0	44.0	16.7	1.900	1.50	0.00	0.00	68.0	48.0	0.00	2.0	0	0	4
114	17	2	53.0	210.0	130.0	43.0	17.2	1.650	0.00	0.00	0.00	70.0	92.0	0.00	2.5	0	0	5
115	17	3	53.0	205.0	125.0	42.5	16.0	1.140	0.00	0.00	0.00	55.5	64.5	0.00	2.0	0	0	4
116	17	4	56.0	232.5	127.5	43.5	17.1	1.590	0.00	0.00	0.00	61.0	59.0	0.00	2.0	0	0	4
117	17	5	53.0	225.0	150.0	41.0	16.9	1.525	0.00	1.30	0.00	75.0	73.5	0.00	2.5	0	0	5
118	17	6	52.5	227.5	122.5	44.5	16.1	1.725	0.00	0.00	0.00	48.0	52.5	0.00	2.0	0	0	4
119	17	7	54.0	197.5	122.5	41.0	16.8	1.300	1.80	0.00	0.00	67.5	93.0	2.40	1.0	0	0	3
120	18	1	55.0	210.0	142.5	43.5	16.9	1.415	0.00	0.00	0.00	58.0	62.0	0.00	2.5	0	0	4

LA MAQUINA 1989 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
121	18	2	52.0	210.0	130.0	41.0	16.3	1.905	1.90	0.00	0	64.5	60.5	1.20	2.0	0	0	4
122	18	3	56.5	232.5	142.5	40.0	17.7	1.525	3.70	0.00	0	61.5	78.0	0.00	2.0	0	0	3
123	18	4	54.0	227.5	132.5	43.5	17.6	1.175	0.00	0.00	0	51.0	73.0	0.00	3.0	0	0	5
124	18	5	52.5	245.0	152.5	44.0	16.8	1.955	0.00	0.00	0	75.0	59.0	0.00	3.0	0	0	6
125	18	6	53.0	220.0	132.5	43.5	17.0	1.595	0.00	0.00	0	56.0	62.5	0.00	2.5	0	0	5
126	18	7	54.5	225.0	127.5	38.0	17.0	1.835	0.00	0.00	0	67.0	53.5	1.30	2.0	0	0	3
127	19	1	53.0	230.0	132.5	44.0	16.4	1.430	2.95	0.00	0	45.5	81.0	0.00	2.5	0	0	4
128	19	2	51.5	230.0	145.0	43.5	16.4	1.725	9.25	0.00	0	63.5	71.0	0.00	2.0	0	0	4
129	19	3	53.0	215.0	145.0	43.0	16.2	0.955	0.00	0.00	0	41.5	65.0	1.15	2.5	0	0	5
130	19	4	53.0	232.5	145.0	42.5	16.3	1.605	3.35	1.20	0	64.0	65.0	1.20	2.0	0	0	4
131	19	5	51.5	237.5	142.5	41.0	16.9	1.895	0.00	0.00	0	69.0	66.5	0.00	2.5	0	0	5
132	19	6	52.5	237.5	132.5	43.0	15.9	1.975	3.15	0.00	0	64.0	43.0	0.00	2.0	0	0	4
133	19	7	52.0	222.5	130.0	41.0	17.2	2.250	3.85	0.00	0	89.5	99.0	1.20	2.0	0	0	4
134	20	1	55.0	225.0	140.0	43.0	16.5	0.950	0.00	0.00	0	48.5	41.0	0.00	2.5	0	0	3
135	20	2	53.5	222.5	127.5	43.5	16.8	0.830	0.00	0.00	0	47.0	72.0	0.00	2.5	0	0	5
136	20	3	53.0	240.0	142.5	42.5	16.7	1.245	2.15	0.00	0	56.5	48.5	0.00	2.5	0	0	4
137	20	4	55.5	235.0	137.5	43.0	17.6	1.110	0.00	0.00	0	42.0	58.0	0.00	2.0	0	0	3
138	20	5	53.0	222.5	130.0	44.0	16.5	1.070	0.00	0.00	0	44.5	35.5	0.00	2.0	0	0	3
139	20	6	53.0	232.5	142.5	44.0	17.0	1.655	1.45	0.00	0	68.5	47.5	0.00	2.5	0	0	4
140	20	7	55.0	217.5	117.5	41.0	16.9	1.065	0.00	0.00	0	50.5	46.0	0.00	2.0	0	0	4
141	21	1	55.5	215.0	122.5	42.0	16.7	1.365	0.00	0.00	0	57.0	68.0	0.00	2.0	0	0	3
142	21	2	55.0	235.0	152.5	43.5	17.1	1.360	9.95	0.00	0	59.0	65.0	0.00	2.0	0	0	3
143	21	3	53.0	232.5	145.0	42.5	17.0	2.245	3.40	0.00	0	69.5	59.0	0.00	2.0	0	0	3
144	21	4	53.5	232.5	125.0	44.0	17.3	2.115	0.00	0.00	0	78.5	63.0	0.00	2.0	0	0	3
145	21	5	51.5	237.5	140.0	42.5	16.9	2.600	1.60	0.00	0	83.5	56.5	0.00	2.0	0	0	3
146	21	6	52.5	235.0	132.5	42.5	17.0	2.310	0.00	0.00	0	78.0	32.0	0.00	2.0	0	0	3
147	21	7	53.5	225.0	122.5	35.0	16.8	2.430	1.85	1.40	0	80.0	66.0	0.00	2.0	0	0	2
148	22	1	56.5	215.0	135.0	43.5	16.5	1.490	2.40	0.00	0	56.5	84.0	1.15	2.0	0	0	3
149	22	2	52.0	222.5	140.0	44.0	16.4	2.625	3.25	0.00	0	80.5	66.0	0.00	2.0	0	0	4
150	22	3	53.5	240.0	130.0	44.0	16.8	1.720	0.00	0.00	0	70.0	48.5	0.00	2.0	0	0	4
151	22	4	53.0	210.0	125.0	43.0	17.0	1.540	6.55	0.00	0	57.0	59.5	0.00	2.5	0	0	4
152	22	5	52.5	260.0	155.0	23.0	16.9	1.835	0.00	0.00	0	92.0	29.5	0.00	2.0	0	0	6
153	22	6	52.5	222.5	122.5	44.0	16.1	1.495	4.00	2.25	0	59.0	58.0	1.15	2.5	0	0	4
154	22	7	55.0	170.0	95.0	39.5	16.0	0.180	0.00	0.00	0	26.5	99.0	4.05	2.0	0	0	4
155	23	1	53.5	237.5	135.0	44.0	16.8	1.245	1.90	0.00	0	53.5	68.0	0.00	2.5	0	0	4
156	23	2	51.5	220.0	120.0	43.0	16.8	2.665	0.00	0.00	0	87.5	44.5	0.00	2.0	0	0	3
157	23	3	52.5	232.5	137.5	44.0	17.6	2.350	1.30	0.00	0	85.0	64.0	0.00	2.0	0	0	3
158	23	4	54.0	220.0	140.0	42.0	17.2	1.535	0.00	0.00	0	54.5	60.5	0.00	2.0	0	0	3
159	23	5	56.5	250.0	137.5	42.5	16.7	1.250	2.50	0.00	0	53.0	74.5	0.00	2.5	0	0	3
160	23	6	52.0	220.0	125.0	42.5	17.2	1.830	0.00	0.00	0	57.5	64.5	0.00	2.0	0	0	3
161	23	7	58.0	250.0	155.0	41.5	16.7	1.250	2.65	0.00	0	50.5	70.0	0.00	2.5	0	0	4

LAS VEGAS 1989 (ENVIRONMENT No. 4)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
1	1	1	57.0	257.5	142.5	40.0	21.1	3.455	0.00	0.00	0.00	80.0	21.0	12.35	0	0	2.8	0
2	1	2	55.0	250.0	142.5	40.0	21.4	3.875	0.00	2.25	2.80	96.0	10.5	7.80	0	0	2.8	0
3	1	3	60.0	250.0	140.0	43.0	22.9	5.205	0.00	6.95	0.00	93.5	5.5	0.00	0	0	2.3	0
4	1	4	58.5	252.5	130.0	40.0	20.9	4.555	0.00	12.50	0.00	107.5	7.0	7.50	0	0	2.5	0
5	1	5	56.0	267.5	140.0	43.0	20.9	5.115	0.00	31.80	0.00	93.0	10.0	9.20	0	0	2.8	0
6	1	6	55.5	245.0	125.0	42.0	21.9	4.395	0.00	0.00	0.00	97.5	19.5	19.05	0	0	2.3	0
7	1	7	58.0	245.0	142.5	39.0	21.4	3.875	0.00	11.10	0.00	102.5	15.5	7.55	0	0	2.8	0
8	2	1	55.0	257.5	132.5	39.0	22.4	5.675	14.75	7.55	0.00	105.5	7.5	5.55	0	0	2.3	0
9	2	2	55.5	245.0	135.0	38.0	20.4	4.705	0.00	7.90	0.00	92.0	8.5	0.00	0	0	2.0	0
10	2	3	56.0	250.0	130.0	37.0	22.5	5.225	8.40	0.00	2.80	94.5	12.0	2.65	0	0	2.0	0
11	2	4	56.5	252.5	132.5	38.0	21.0	4.915	2.50	0.00	2.80	94.5	6.5	8.05	0	0	2.3	0
12	2	5	57.0	245.0	132.5	40.0	21.3	4.210	11.80	27.70	2.40	85.5	5.5	5.05	0	0	2.3	0
13	2	6	55.0	250.0	125.0	38.0	21.4	4.965	2.50	9.50	2.95	103.5	8.0	10.65	0	0	2.0	0
14	2	7	55.0	260.0	137.5	42.0	23.0	4.120	2.65	0.00	0.00	83.0	5.5	11.90	0	0	2.5	0
15	3	1	56.5	220.0	122.5	43.5	21.9	5.155	2.25	6.00	0.00	94.0	14.0	4.00	0	0	2.0	0
16	3	2	53.5	240.0	125.0	38.0	21.0	4.795	17.30	5.30	2.65	92.0	12.0	15.80	0	0	2.5	0
17	3	3	56.0	240.0	127.5	43.5	22.8	5.550	8.70	14.60	2.40	91.0	2.0	4.75	0	0	2.3	0
18	3	4	57.0	232.5	127.5	40.0	23.7	4.835	9.10	18.40	2.65	101.0	15.5	0.00	0	0	2.5	0
19	3	5	56.0	242.5	137.5	42.0	21.5	4.745	4.75	9.50	2.40	95.0	9.5	4.80	0	0	2.3	0
20	3	6	54.5	210.0	105.0	38.0	21.1	4.330	0.00	13.05	2.80	84.5	15.5	8.05	0	0	2.5	0
21	3	7	56.5	220.0	122.5	31.0	21.8	2.755	3.35	0.00	2.40	80.5	16.5	16.90	0	0	2.3	0
22	4	1	59.5	270.0	135.0	42.0	22.1	4.600	2.65	5.25	0.00	86.0	22.0	9.60	0	0	2.5	0
23	4	2	58.0	270.0	135.0	40.0	21.3	4.545	2.80	16.65	0.00	93.0	16.5	7.40	0	0	2.5	0
24	4	3	57.0	260.0	132.5	38.0	22.0	3.715	3.15	2.80	2.80	83.5	10.0	2.80	0	0	2.3	0
25	4	4	57.0	255.0	130.0	40.0	22.8	5.855	0.00	12.95	0.00	97.5	15.0	15.05	0	0	2.5	0
26	4	5	56.5	267.5	137.5	42.0	21.8	6.480	2.25	4.80	0.00	102.5	7.0	11.90	0	0	2.3	0
27	4	6	58.0	260.0	127.5	41.0	22.9	5.405	0.00	12.40	5.00	95.0	9.0	14.65	0	0	3.0	0
28	4	7	56.0	242.5	122.5	37.0	20.7	3.115	5.00	2.95	0.00	69.0	18.5	5.00	0	0	2.5	0
29	5	1	54.5	250.0	120.0	42.0	23.1	4.435	6.65	2.50	0.00	80.5	11.5	4.75	0	0	2.8	0
30	5	2	53.0	255.0	122.5	39.0	22.7	5.440	0.00	0.00	0.00	100.0	8.0	10.00	0	0	2.5	0
31	5	3	55.0	247.5	120.0	40.0	22.0	4.930	2.65	0.00	0.00	92.5	5.5	10.00	0	0	2.5	0
32	5	4	56.5	240.0	122.5	43.5	21.2	5.435	2.10	7.50	0.00	98.0	15.5	6.00	0	0	2.3	0
33	5	5	54.5	255.0	137.5	41.0	21.1	5.550	2.65	4.75	0.00	95.0	13.0	0.00	0	0	2.5	0
34	5	6	55.0	230.0	110.0	40.0	21.0	4.665	0.00	2.50	0.00	100.0	7.0	17.50	0	0	2.8	0
35	5	7	56.0	255.0	132.5	41.0	21.5	3.985	0.00	10.00	0.00	97.5	10.0	9.50	0	0	2.8	0
36	6	1	52.0	265.0	140.0	41.0	19.9	4.730	2.65	5.00	0.00	92.5	8.0	0.00	0	0	2.5	0
37	6	2	51.5	260.0	142.5	40.0	21.4	4.980	3.15	14.30	10.30	85.0	6.0	0.00	0	0	2.1	0
38	6	3	52.0	252.5	140.0	40.0	21.3	4.985	9.30	4.75	0.00	84.5	0.0	2.40	0	0	2.3	0
39	6	4	51.5	265.0	137.5	39.0	21.9	5.160	8.60	10.45	0.00	85.5	2.5	0.00	0	0	2.5	0
40	6	5	53.0	257.5	135.0	38.0	20.0	5.410	0.00	31.65	0.00	92.0	3.0	0.00	0	0	2.3	0

LAS VEGAS 1989 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
41	6	6	51.0	245.0	132.5	38.0	19.0	6.150	2.25	2.80	2.50	108.5	7.0	5.55	0	0	2.3	0
42	6	7	51.5	257.5	135.0	38.0	20.8	4.790	0.00	5.25	0.00	97.5	8.0	5.25	0	0	2.5	0
43	7	1	56.5	250.0	135.0	40.0	20.0	3.830	2.50	0.00	2.50	90.0	13.0	10.00	0	0	2.5	0
44	7	2	55.0	245.0	130.0	42.0	20.8	4.130	0.00	26.20	0.00	90.5	11.5	4.75	0	0	2.5	0
45	7	3	56.5	245.0	122.5	42.0	21.3	3.760	0.00	0.00	0.00	93.0	13.0	9.30	0	0	2.5	0
46	7	4	54.5	225.0	117.5	40.0	22.3	4.705	2.95	0.00	5.00	87.5	11.0	10.00	0	0	2.5	0
47	7	5	56.0	240.0	130.0	41.0	18.9	3.770	2.65	4.55	0.00	93.0	8.0	9.45	0	0	2.5	0
48	7	6	55.5	232.5	117.5	39.0	19.8	3.600	0.00	12.50	0.00	84.5	12.5	5.25	0	0	2.3	0
49	7	7	54.5	237.5	120.0	41.0	19.7	3.275	5.05	5.00	0.00	97.5	20.0	9.90	0	0	2.5	0
50	8	1	55.0	262.5	140.0	39.0	20.3	4.600	3.15	0.00	2.65	87.0	0.0	0.00	0	0	2.3	0
51	8	2	53.0	265.0	137.5	42.0	19.8	4.735	0.00	4.75	4.75	88.0	10.5	7.15	0	0	2.3	0
52	8	3	55.0	255.0	137.5	40.0	20.2	4.150	0.00	0.00	0.00	83.0	6.0	4.55	0	0	2.3	0
53	8	4	56.0	270.0	147.5	43.0	20.5	4.580	2.95	0.00	0.00	87.0	8.5	9.35	0	0	2.5	0
54	8	5	53.5	275.0	150.0	43.5	19.7	5.085	2.40	2.40	0.00	87.0	2.5	0.00	0	0	2.5	0
55	8	6	55.5	250.0	130.0	41.0	21.4	4.535	0.00	7.50	2.50	97.5	7.0	9.75	0	0	2.8	0
56	8	7	54.0	257.5	137.5	41.0	19.8	4.185	2.95	10.00	0.00	99.5	14.0	7.50	0	0	3.0	0
57	9	1	56.5	280.0	165.0	41.0	20.1	4.835	5.55	27.40	2.50	90.0	13.5	9.65	0	0	2.8	0
58	9	2	54.5	270.0	160.0	36.0	21.9	4.620	8.35	5.90	0.00	106.5	20.5	8.55	0	0	2.5	0
59	9	3	57.5	265.0	142.5	36.0	19.9	3.495	0.00	2.65	0.00	72.5	7.0	5.25	0	0	2.8	0
60	9	4	56.5	250.0	137.5	40.0	20.5	4.135	0.00	27.80	0.00	94.5	14.0	7.80	0	0	2.8	0
61	9	5	54.0	270.0	157.5	43.5	21.9	6.150	7.90	0.00	0.00	89.5	12.5	6.50	0	0	2.5	0
62	9	6	54.0	265.0	142.5	39.0	22.2	3.935	3.15	30.15	0.00	92.0	14.0	22.65	0	0	2.3	0
63	9	7	54.5	260.0	147.5	44.0	21.9	3.960	0.00	0.00	2.25	86.0	25.5	6.80	0	0	2.3	0
64	10	1	53.0	270.0	150.0	44.0	21.7	5.835	2.25	0.00	0.00	95.5	2.5	0.00	0	0	2.3	0
65	10	2	52.5	287.5	150.0	41.0	20.4	6.500	0.00	9.65	0.00	95.0	2.5	2.40	0	0	2.3	0
66	10	3	52.5	265.0	137.5	41.0	21.6	6.505	0.00	4.75	0.00	100.0	0.0	0.00	0	0	2.5	0
67	10	4	54.0	280.0	145.0	42.0	20.8	6.020	0.00	9.10	0.00	95.0	4.5	0.00	0	0	2.5	0
68	10	5	54.0	295.0	155.0	39.0	20.0	6.415	0.00	12.70	0.00	97.5	3.0	0.00	0	0	2.3	0
69	10	6	53.0	265.0	142.5	41.0	21.3	5.650	2.65	7.50	2.50	87.5	14.5	9.90	0	0	2.3	0
70	10	7	53.5	272.5	145.0	44.0	21.9	5.060	0.00	0.00	0.00	82.5	5.5	8.90	0	0	2.8	0
71	11	1	58.0	262.5	140.0	37.0	20.0	4.840	0.00	0.00	0.00	94.5	6.0	6.25	0	0	2.5	0
72	11	2	52.0	250.0	132.5	40.0	20.6	6.480	0.00	2.65	0.00	102.5	5.0	2.65	0	0	2.0	0
73	11	3	54.5	245.0	127.5	40.0	21.0	5.675	3.15	0.00	2.25	85.5	3.0	5.55	0	0	2.0	0
74	11	4	55.5	230.0	127.5	44.0	20.5	6.710	0.00	8.40	2.40	93.0	2.0	7.15	0	0	2.5	0
75	11	5	55.0	270.0	150.0	39.0	20.8	6.345	0.00	2.50	0.00	94.5	8.5	2.65	0	0	2.5	0
76	11	6	53.5	225.0	115.0	38.0	20.6	5.135	0.00	5.30	2.80	99.5	12.5	21.10	0	0	2.3	0
77	11	7	55.5	245.0	127.5	37.0	21.4	4.645	0.00	5.55	0.00	86.5	6.0	13.60	0	0	2.3	0
78	12	1	56.5	260.0	140.0	40.0	21.1	5.210	0.00	2.50	0.00	95.0	5.0	5.00	0	0	2.3	0
79	12	2	56.0	255.0	147.5	37.0	20.1	6.070	2.65	15.00	7.50	97.5	3.0	0.00	0	0	2.3	0
80	12	3	57.0	250.0	137.5	43.0	21.5	5.195	0.00	2.40	0.00	95.0	5.0	2.40	0	0	2.3	0

LAS VEGAS 1989 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK	PLTH	EARH	STAND	HUM	YIELD	HUSK	RLODG	SLODG	PROLIF	EROT	VIR	HELM	PPHELM	RUST	CURV
			days	cm	cm	plot	%	t/ha	%	%	%	%	%	%	1-10	%	1-10	1-10
81	12	4	56.5	262.5	135.0	29.0	20.9	4.230	8.85	2.95	0.00	79.5	9.0	12.95	0	0	2.0	0
82	12	5	54.5	260.0	140.0	43.0	20.6	6.155	0.00	2.50	0.00	109.5	17.0	2.50	0	0	2.0	0
83	12	6	55.5	240.0	125.0	41.0	21.4	5.200	0.00	0.00	0.00	95.0	0.0	12.25	0	0	2.3	0
84	12	7	56.5	255.0	130.0	41.0	20.5	4.695	0.00	0.00	0.00	92.0	11.0	15.40	0	0	2.3	0
85	13	1	56.0	260.0	150.0	42.0	21.9	6.810	2.50	2.40	0.00	95.0	5.0	7.15	0	0	2.0	0
86	13	2	54.5	265.0	142.5	43.0	21.1	6.995	0.00	0.00	2.25	93.5	2.5	11.70	0	0	2.0	0
87	13	3	56.5	257.5	145.0	32.0	21.1	4.550	2.65	2.65	0.00	96.0	8.0	3.85	0	0	2.5	0
88	13	4	54.5	262.5	145.0	43.0	22.9	6.620	0.00	0.00	2.25	90.5	5.0	7.00	0	0	2.0	0
89	13	5	54.5	262.5	147.5	43.5	21.6	7.945	2.65	2.40	0.00	93.0	0.0	0.00	0	0	2.0	0
90	13	6	55.5	250.0	140.0	43.0	22.3	7.000	2.40	2.15	0.00	96.0	5.0	5.00	0	0	2.3	0
91	13	7	54.5	255.0	135.0	40.0	23.0	6.715	2.80	2.65	0.00	92.5	0.0	4.75	0	0	2.0	0
92	14	1	55.5	252.5	135.0	43.0	21.7	6.390	2.50	4.75	0.00	98.0	9.0	6.95	0	0	2.3	0
93	14	2	55.5	255.0	140.0	40.0	21.1	6.650	2.50	0.00	0.00	100.0	2.5	2.50	0	0	2.0	0
94	14	3	54.5	252.5	130.0	41.0	22.0	7.125	0.00	0.00	0.00	90.0	2.5	0.00	0	0	2.0	0
95	14	4	54.5	250.0	127.5	40.0	21.5	8.185	0.00	0.00	0.00	107.5	0.0	0.00	0	0	2.0	0
96	14	5	55.0	245.0	135.0	44.0	22.7	7.065	0.00	21.45	2.40	85.5	3.5	2.40	0	0	2.3	0
97	14	6	53.0	245.0	130.0	43.0	20.3	6.500	2.25	13.65	0.00	97.5	9.5	9.20	0	0	2.3	0
98	14	7	53.5	245.0	125.0	43.0	22.8	6.085	0.00	0.00	0.00	86.0	5.5	0.00	0	0	2.0	0
99	15	1	55.5	255.0	135.0	38.0	21.3	5.535	11.90	2.80	2.80	89.0	3.5	5.55	0	0	2.3	0
100	15	2	54.5	265.0	145.0	42.0	20.8	5.570	0.00	19.10	4.55	98.0	18.5	2.25	0	0	2.3	0
101	15	3	54.0	265.0	137.5	41.0	22.6	5.765	0.00	7.25	4.90	85.0	5.5	4.90	0	0	2.3	0
102	15	4	53.5	260.0	137.5	42.0	21.5	5.845	0.00	12.70	0.00	95.5	3.0	2.15	0	0	2.3	0
103	15	5	54.5	265.0	147.5	38.0	20.8	6.795	0.00	8.80	2.95	94.5	2.5	0.00	0	0	2.5	0
104	15	6	53.5	275.0	145.0	38.0	20.6	6.695	2.50	7.80	2.80	105.5	0.0	2.50	0	0	2.3	0
105	15	7	55.0	260.0	140.0	43.5	20.2	4.490	0.00	9.00	0.00	86.5	10.0	15.50	0	0	2.8	0
106	16	1	56.0	250.0	127.5	39.0	21.0	5.225	4.75	5.55	0.00	100.0	10.0	0.00	0	0	2.3	0
107	16	2	57.0	250.0	140.0	39.0	19.7	4.080	0.00	2.65	15.80	89.5	18.0	13.05	0	0	2.5	0
108	16	3	55.0	250.0	127.5	40.0	21.1	4.995	2.80	4.75	0.00	92.5	2.5	2.65	0	0	2.3	0
109	16	4	57.0	260.0	122.5	43.0	20.3	4.600	0.00	16.25	0.00	91.0	16.0	0.00	0	0	2.5	0
110	16	5	54.5	260.0	142.5	40.0	21.5	5.850	0.00	2.50	0.00	95.0	7.5	5.00	0	0	2.3	0
111	16	6	53.0	250.0	130.0	44.0	22.1	5.915	0.00	11.90	0.00	95.5	5.0	0.00	0	0	2.5	0
112	16	7	55.5	240.0	120.0	41.0	19.4	3.505	0.00	2.40	0.00	112.0	23.5	7.40	0	0	2.5	0
113	17	1	57.0	255.0	132.5	40.0	19.3	4.310	2.50	0.00	5.25	89.5	21.5	2.65	0	0	2.0	0
114	17	2	56.0	255.0	137.5	42.0	19.4	4.310	0.00	2.25	0.00	90.0	13.5	9.75	0	0	2.3	0
115	17	3	55.5	230.0	130.0	41.0	21.9	4.400	0.00	2.40	0.00	80.5	9.5	7.15	0	0	2.3	0
116	17	4	56.5	257.5	130.0	42.0	19.9	4.740	0.00	10.85	0.00	83.5	12.0	7.40	0	0	2.3	0
117	17	5	53.5	262.5	132.5	42.0	20.1	5.390	0.00	0.00	0.00	87.5	11.0	9.55	0	0	2.5	0
118	17	6	54.0	255.0	135.0	43.0	21.2	5.765	0.00	4.55	0.00	100.0	11.5	7.15	0	0	2.3	0
119	17	7	57.5	237.5	125.0	39.0	18.6	2.305	0.00	2.95	2.95	69.5	52.0	11.35	0	0	2.5	0
120	18	1	54.5	252.5	147.5	43.5	21.4	4.875	10.55	15.20	2.15	86.5	5.5	4.75	0	0	2.3	0

LAS VEGAS 1989 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
121	18	2	53.0	257.5	140.0	41.0	22.5	5.015	2.95	22.50	2.50	87.5	5.5	2.40	0	0	2.5	0
122	18	3	55.5	262.5	137.5	34.0	21.4	4.085	3.55	2.80	0.00	85.5	14.0	11.80	0	0	2.5	0
123	18	4	54.5	255.0	135.0	40.0	23.3	5.610	0.00	15.30	0.00	91.0	3.5	5.25	0	0	2.3	0
124	18	5	55.5	280.0	152.5	41.0	21.7	5.175	0.00	19.75	0.00	95.0	5.0	2.50	0	0	2.8	0
125	18	6	54.5	250.0	125.0	39.0	21.6	5.630	0.00	23.05	2.50	95.0	0.0	12.90	0	0	2.8	0
126	18	7	56.0	252.5	130.0	26.0	20.9	4.000	2.95	6.65	0.00	97.5	6.0	3.35	0	0	2.3	0
127	19	1	53.5	255.0	132.5	42.0	21.4	5.850	10.55	7.15	4.75	90.0	16.0	2.40	0	0	2.8	0
128	19	2	54.5	260.0	140.0	41.0	19.9	5.070	0.00	31.00	0.00	89.5	9.0	2.25	0	0	2.5	0
129	19	3	54.5	260.0	135.0	43.0	21.8	5.940	0.00	16.25	0.00	95.0	2.5	13.95	0	0	2.5	0
130	19	4	55.5	272.5	137.5	41.0	19.7	5.425	2.65	11.90	0.00	97.5	10.5	2.50	0	0	2.5	0
131	19	5	56.0	265.0	152.5	40.0	21.7	4.290	0.00	15.00	2.50	92.5	11.0	7.50	0	0	2.3	0
132	19	6	53.5	250.0	125.0	38.0	21.7	4.845	0.00	5.30	7.80	103.0	10.5	13.35	0	0	2.8	0
133	19	7	53.0	242.5	135.0	40.0	20.7	5.130	0.00	7.50	0.00	100.0	27.5	2.50	0	0	2.5	0
134	20	1	57.0	250.0	122.5	43.0	20.6	6.255	0.00	11.90	0.00	100.0	9.5	2.40	0	0	2.0	0
135	20	2	54.5	255.0	135.0	38.0	20.6	5.480	0.00	5.30	2.50	94.5	7.5	5.00	0	0	2.0	0
136	20	3	56.0	235.0	125.0	39.0	20.1	5.060	2.80	2.80	0.00	93.0	3.0	5.55	0	0	2.3	0
137	20	4	55.5	235.0	122.5	39.0	20.3	6.390	0.00	12.90	2.65	103.0	2.5	7.50	0	0	2.0	0
138	20	5	54.5	240.0	125.0	39.0	19.6	7.015	2.80	5.15	5.25	103.0	0.0	0.00	0	0	2.5	0
139	20	6	56.0	235.0	117.5	40.0	20.6	5.360	0.00	22.50	0.00	97.5	2.5	2.50	0	0	2.5	0
140	20	7	55.5	240.0	125.0	43.5	20.5	5.810	0.00	0.00	2.25	86.0	0.0	2.25	0	0	2.3	0
141	21	1	57.5	252.5	122.5	38.0	19.6	3.055	2.50	5.30	0.00	94.5	16.5	7.90	0	0	2.8	0
142	21	2	58.0	265.0	135.0	22.0	21.7	2.860	0.00	9.10	0.00	82.0	11.0	13.65	0	0	2.5	0
143	21	3	56.5	255.0	127.5	42.0	21.5	5.415	2.95	0.00	0.00	88.0	0.0	0.00	0	0	3.0	0
144	21	4	56.0	250.0	127.5	39.0	21.1	5.440	2.65	15.40	0.00	105.5	2.5	5.25	0	0	3.0	0
145	21	5	55.0	270.0	137.5	40.0	20.2	5.500	2.40	2.50	0.00	102.5	5.0	5.00	0	0	2.5	0
146	21	6	57.0	245.0	132.5	30.0	21.0	4.315	7.50	0.00	0.00	100.0	5.0	2.50	0	0	2.3	0
147	21	7	54.0	242.5	125.0	35.0	18.7	3.885	0.00	0.00	2.80	94.0	12.5	0.00	0	0	2.8	0
148	22	1	56.0	260.0	140.0	44.0	20.8	7.795	0.00	0.00	0.00	95.5	2.5	4.75	0	0	2.3	0
149	22	2	53.0	275.0	152.5	43.0	20.7	6.680	0.00	0.00	0.00	102.5	18.5	4.65	0	0	2.3	0
150	22	3	54.5	245.0	127.5	44.0	22.2	7.650	0.00	4.30	0.00	93.5	4.5	4.35	0	0	2.0	0
151	22	4	57.0	265.0	130.0	40.0	21.5	5.295	2.80	0.00	0.00	103.5	21.5	4.75	0	0	2.5	0
152	22	5	56.5	282.5	147.5	30.0	20.2	4.380	0.00	16.65	0.00	98.5	3.0	0.00	0	0	2.5	0
153	22	6	55.0	232.5	115.0	39.0	20.8	2.895	0.00	28.00	9.40	76.5	7.0	15.65	0	0	2.8	0
154	22	7	58.5	185.0	92.5	34.0	19.3	0.900	8.35	6.80	0.00	84.0	86.5	0.00	0	0	3.8	0
155	23	1	56.0	262.5	137.5	39.0	21.5	4.630	0.00	13.05	0.00	92.0	5.5	10.25	0	0	2.5	0
156	23	2	57.5	270.0	140.0	40.0	22.6	5.200	2.65	12.50	0.00	90.0	8.5	7.50	0	0	2.5	0
157	23	3	54.0	260.0	137.5	40.0	19.9	5.970	5.00	0.00	0.00	103.0	10.0	0.00	0	0	2.0	0
158	23	4	56.5	250.0	135.0	43.5	21.1	4.775	2.65	4.15	0.00	95.5	9.0	13.75	0	0	2.5	0
159	23	5	56.0	265.0	147.5	42.0	20.1	5.270	5.55	14.10	0.00	90.5	10.0	4.75	0	0	2.5	0
160	23	6	54.5	235.0	120.0	43.0	20.0	3.600	0.00	18.40	2.40	81.5	14.5	13.95	0	0	2.8	0
161	23	7	59.0	262.5	142.5	37.0	21.4	5.080	7.80	12.50	0.00	104.0	11.0	0.00	0	0	2.3	0

SAN JERONIMO 1990 (ENVIRONMENT No. 5)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
1	1	1	94.5	195.0	85.0	7.5	21.8	1.560	36.65	0.00	44.45	105.5	5.0	0.00	2.0	0	4.0	0
2	1	2	91.5	210.0	115.0	40.5	22.1	8.565	5.45	0.00	0.00	115.0	2.0	11.10	2.5	0	2.5	0
3	1	3	96.5	205.0	100.0	43.5	22.9	8.620	3.50	0.00	0.00	100.0	4.5	6.90	3.0	0	2.5	0
4	1	4	95.5	215.0	125.0	43.5	24.2	9.625	9.90	0.00	0.00	116.0	2.0	5.80	2.5	0	2.5	0
5	1	5	92.5	205.0	115.0	43.5	20.6	9.095	1.00	0.00	0.00	108.0	2.0	1.15	3.0	0	2.5	0
6	1	6	92.0	215.0	105.0	42.5	23.2	11.130	2.55	0.00	1.15	140.5	2.0	5.90	2.5	0	2.5	0
7	1	7	92.0	210.0	105.0	43.5	22.9	9.585	1.65	0.00	0.00	128.0	2.0	3.40	2.0	0	2.0	0
8	2	1	89.5	205.0	90.0	36.0	20.6	6.840	9.10	0.00	0.00	107.5	5.5	1.30	2.5	0	3.0	0
9	2	2	88.0	205.0	90.0	34.0	20.3	6.595	14.90	1.45	0.00	117.5	1.0	4.35	2.5	0	2.5	0
10	2	3	89.0	210.0	105.0	34.5	18.1	7.475	25.95	0.00	0.00	111.5	1.0	4.50	3.0	0	2.5	0
11	2	4	91.5	205.0	100.0	38.5	20.3	8.055	11.70	0.00	0.00	113.5	3.0	5.10	4.0	0	3.0	0
12	2	5	91.0	205.0	85.0	31.5	19.5	6.895	9.15	0.00	0.00	124.0	1.5	3.15	3.0	0	2.5	0
13	2	6	87.5	195.0	85.0	34.0	19.9	6.260	8.30	0.00	0.00	123.5	3.5	7.50	3.0	0	3.0	0
14	2	7	87.0	185.0	85.0	32.0	22.3	5.415	16.95	0.00	0.00	120.5	1.5	10.95	3.0	0	3.0	0
15	3	1	91.0	210.0	120.0	42.0	19.4	8.455	8.45	1.25	0.00	101.0	3.5	7.25	2.5	0	3.0	0
16	3	2	90.5	210.0	115.0	40.0	19.4	7.950	5.65	0.00	2.45	111.5	0.0	3.75	2.0	0	3.0	0
17	3	3	91.5	220.0	125.0	44.0	21.2	8.395	12.60	0.00	0.00	99.0	1.0	1.15	2.0	0	2.5	0
18	3	4	92.5	205.0	105.0	42.5	20.2	9.550	8.30	0.00	3.55	114.5	2.0	2.35	3.0	0	2.5	0
19	3	5	91.0	210.0	120.0	43.5	18.5	8.645	7.95	1.15	0.00	101.0	6.5	0.00	3.0	0	3.0	0
20	3	6	90.5	205.0	105.0	42.0	19.1	8.260	3.35	3.55	0.00	112.0	5.5	3.65	3.0	0	2.0	0
21	3	7	89.0	205.0	95.0	38.5	18.8	8.240	7.25	0.00	1.25	125.5	1.0	6.45	2.5	0	3.0	0
22	4	1	93.5	220.0	105.0	43.5	21.0	9.760	6.20	0.00	1.15	112.5	6.0	5.75	3.0	0	3.0	0
23	4	2	90.5	230.0	100.0	43.0	20.3	10.460	13.70	0.00	0.00	117.5	3.0	0.00	2.5	0	3.0	0
24	4	3	92.5	200.0	95.0	7.5	21.5	2.010	14.10	0.00	0.00	141.0	9.5	0.00	2.5	0	4.0	0
25	4	4	94.0	225.0	115.0	44.0	22.1	11.200	4.35	0.00	1.15	105.0	2.0	1.15	3.0	0	3.0	0
26	4	5	93.0	225.0	115.0	44.0	19.4	10.805	9.95	0.00	0.00	107.0	1.0	0.00	2.0	0	3.0	0
27	4	6	93.5	230.0	120.0	43.0	19.3	10.035	9.90	1.15	2.35	116.0	3.0	1.15	2.5	0	3.5	0
28	4	7	92.0	225.0	115.0	33.0	19.5	8.635	7.80	0.00	0.00	144.5	6.5	4.75	2.0	0	3.0	0
29	5	1	93.0	200.0	95.0	43.0	21.3	7.860	3.65	0.00	0.00	96.5	7.5	9.30	3.5	0	3.5	0
30	5	2	91.0	195.0	90.0	43.0	21.0	7.835	6.70	0.00	1.15	104.5	4.5	3.50	3.5	0	3.0	0
31	5	3	93.5	205.0	110.0	43.0	20.7	7.285	3.60	0.00	3.50	100.0	8.5	4.65	3.0	0	3.0	0
32	5	4	94.0	210.0	105.0	43.0	20.2	8.960	1.00	0.00	0.00	115.5	4.0	3.40	3.0	0	3.5	0
33	5	5	92.0	200.1	95.1	38.5	20.4	7.310	3.65	0.00	0.00	109.0	4.5	3.85	2.5	0	3.0	0
34	5	6	92.0	190.0	105.0	42.5	20.9	8.745	4.75	0.00	0.00	125.0	2.0	5.85	3.0	0	3.0	0
35	5	7	92.0	200.0	95.0	42.5	20.5	8.335	3.00	4.65	0.00	116.5	4.0	4.75	3.0	0	3.0	0
36	6	1	87.5	220.0	130.0	43.0	17.6	8.185	8.90	0.00	1.15	106.0	5.0	1.20	3.0	0	3.0	0
37	6	2	87.5	215.0	125.0	42.5	17.0	7.575	9.60	0.00	0.00	100.0	3.5	7.00	2.5	0	3.0	0
38	6	3	87.5	210.0	105.0	42.0	18.2	7.885	18.45	0.00	1.15	103.5	3.5	6.00	2.5	0	3.0	0
39	6	4	89.0	220.0	115.0	43.5	17.7	8.400	11.25	0.00	1.15	112.5	4.0	4.65	3.0	0	3.0	0
40	6	5	89.5	230.0	130.0	42.0	18.1	8.070	10.70	2.40	0.00	101.5	2.0	2.40	2.5	0	3.0	0

SAN JERONIMO 1990 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
41	6	6	86.5	210.0	110.0	42.0	17.6	7.890	3.85	0.00	1.25	122.5	4.0	4.75	3.0	0	2.5	0
42	6	7	87.0	205.0	105.0	41.0	18.4	7.400	6.65	0.00	3.40	112.5	5.0	5.10	3.0	0	3.0	0
43	7	1	88.0	205.0	110.0	43.0	18.9	7.430	5.30	0.00	1.15	109.5	1.0	1.15	3.0	0	3.5	0
44	7	2	89.0	205.0	105.0	42.5	19.2	7.195	6.40	0.00	3.40	112.5	3.0	3.65	3.0	0	4.5	0
45	7	3	89.5	205.0	100.0	40.5	19.7	7.335	9.65	0.00	0.00	112.5	4.0	4.95	3.5	0	4.0	0
46	7	4	91.5	215.0	100.0	42.0	19.2	7.050	4.70	0.00	0.00	101.0	6.0	2.40	3.0	0	5.0	0
47	7	5	91.0	205.0	115.0	41.5	18.1	7.375	12.50	0.00	3.65	106.0	3.5	4.85	2.5	0	4.5	0
48	7	6	89.0	205.0	115.0	41.5	18.8	7.360	1.05	0.00	3.70	121.5	4.0	2.55	3.0	0	5.0	0
49	7	7	88.0	205.0	100.0	42.5	20.0	7.845	5.45	0.00	0.00	124.5	3.0	3.55	3.0	0	4.0	0
50	8	1	89.0	200.0	105.0	42.0	20.0	8.490	10.50	0.00	0.00	114.5	2.0	4.75	3.0	0	3.0	0
51	8	2	87.5	200.0	90.0	42.0	18.8	7.320	19.75	0.00	0.00	90.0	2.5	4.80	2.5	0	2.5	0
52	8	3	92.0	200.0	100.0	43.0	19.2	9.165	20.60	0.00	0.00	107.0	3.0	1.20	3.0	0	3.0	0
53	8	4	91.5	190.0	95.0	41.0	21.1	9.090	11.55	0.00	0.00	117.5	2.0	3.70	3.0	0	3.0	0
54	8	5	93.0	205.0	100.0	41.0	19.4	8.280	4.30	0.00	0.00	112.5	2.0	4.90	3.0	0	2.5	0
55	8	6	90.0	190.0	90.0	41.0	21.5	8.195	5.30	0.00	0.00	139.5	2.0	9.70	3.0	0	3.0	0
56	8	7	88.5	185.0	95.0	42.5	19.9	8.035	5.10	0.00	0.00	116.5	3.0	3.65	2.5	0	3.0	0
57	9	1	92.5	230.0	110.0	44.0	20.0	8.740	9.15	0.00	4.55	101.0	3.5	1.15	3.0	0	3.5	0
58	9	2	91.5	225.0	120.0	41.0	19.4	7.565	5.55	0.00	2.40	104.0	3.5	4.90	3.0	0	4.5	0
59	9	3	95.5	235.0	135.0	42.5	20.6	8.655	14.45	0.00	0.00	97.5	4.5	1.15	3.0	0	4.0	0
60	9	4	94.5	235.0	125.0	43.0	22.7	8.105	2.20	0.00	1.15	103.5	1.0	5.80	2.5	0	4.0	0
61	9	5	94.0	230.0	130.0	43.5	20.7	9.905	5.20	0.00	0.00	113.5	1.0	1.15	2.5	0	3.5	0
62	9	6	92.5	225.0	115.0	42.0	20.4	8.785	1.00	1.20	2.35	109.0	1.0	1.20	3.0	0	3.5	0
63	9	7	93.5	210.0	110.0	33.5	19.7	6.965	8.90	1.65	0.00	122.0	3.5	1.35	3.0	0	4.5	0
64	10	1	91.0	210.0	105.0	41.5	19.9	8.045	8.60	0.00	0.00	97.5	2.5	4.90	3.5	0	3.5	0
65	10	2	89.0	215.0	95.0	41.5	19.4	7.585	5.00	0.00	0.00	103.0	2.5	0.00	2.5	0	3.5	0
66	10	3	90.5	230.0	110.0	44.0	20.9	8.520	11.30	0.00	0.00	100.0	1.0	1.15	3.5	0	3.0	0
67	10	4	92.5	225.0	100.0	43.5	19.3	8.420	7.10	0.00	0.00	97.5	0.0	1.15	3.0	0	3.0	0
68	10	5	92.0	225.0	110.0	44.0	20.0	8.280	5.70	0.00	0.00	103.5	1.0	2.25	3.0	0	3.5	0
69	10	6	90.0	215.0	95.0	43.5	19.6	8.160	8.05	0.00	0.00	100.0	1.0	4.65	4.0	0	3.5	0
70	10	7	91.5	195.0	80.0	40.5	19.9	7.450	7.25	0.00	0.00	101.0	4.0	2.45	2.5	0	3.5	0
71	11	1	88.5	210.0	110.0	42.0	19.1	7.295	8.55	0.00	0.00	95.5	2.5	5.95	3.0	0	4.0	0
72	11	2	89.0	220.0	105.0	43.5	18.8	7.820	7.95	0.00	1.15	101.0	1.0	4.55	3.5	0	4.0	0
73	11	3	90.0	210.0	105.0	44.0	20.4	8.020	10.30	0.00	0.00	97.5	2.5	4.50	3.0	0	3.5	0
74	11	4	91.5	210.0	105.0	44.0	20.9	8.105	14.30	0.00	0.00	109.0	2.0	2.25	3.5	0	3.5	0
75	11	5	90.5	235.0	130.0	43.5	20.5	8.380	6.60	0.00	0.00	107.0	2.0	3.40	3.0	0	3.0	0
76	11	6	89.0	215.0	115.0	42.5	19.4	7.495	4.35	0.00	0.00	106.0	2.5	4.60	3.0	0	4.0	0
77	11	7	90.0	205.0	95.0	42.0	20.4	9.125	20.00	0.00	0.00	102.5	2.0	1.25	3.5	0	3.5	0
78	12	1	85.5	230.0	115.0	42.0	19.6	8.435	8.35	0.00	1.25	101.5	2.0	1.25	2.5	0	3.5	0
79	12	2	87.5	205.1	95.1	44.0	17.7	8.260	10.45	0.00	0.00	98.0	4.5	2.30	3.0	0	5.0	0
80	12	3	90.0	235.0	130.0	43.5	18.4	8.280	12.65	0.00	1.15	91.0	1.5	5.75	3.0	0	3.5	0

SAN JERONIMO 1990 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
81	12	4	93.0	220.0	105.0	9.5	20.4	2.410	14.25	0.00	0.00	148.0	7.0	0.00	3.0	0	5.0	0
82	12	5	88.0	225.0	115.0	43.0	18.1	8.840	8.45	1.15	0.00	97.5	0.0	3.50	3.5	0	4.0	0
83	12	6	89.0	220.0	105.0	43.5	20.1	7.930	3.40	0.00	1.15	102.0	3.5	3.50	3.5	0	3.5	0
84	12	7	87.0	220.0	112.5	41.0	20.0	8.355	9.75	1.20	0.00	100.0	4.0	1.20	3.0	0	4.0	0
85	13	1	87.5	195.0	100.0	43.0	19.3	9.110	14.45	0.00	0.00	105.0	3.5	1.15	2.5	0	2.5	0
86	13	2	89.0	215.0	110.0	29.5	18.8	6.995	4.85	0.00	0.00	141.5	2.0	1.55	3.0	0	2.5	0
87	13	3	96.0	200.0	85.0	6.5	21.2	1.890	4.55	0.00	0.00	145.0	4.5	0.00	3.0	0	4.5	0
88	13	4	92.0	210.0	115.0	44.0	22.3	10.450	5.15	0.00	0.00	134.0	2.0	2.30	2.5	0	2.0	0
89	13	5	89.5	215.0	110.0	44.0	20.9	9.555	2.20	0.00	0.00	106.5	2.0	4.55	2.5	0	2.0	0
90	13	6	88.5	205.0	110.0	43.0	19.7	10.075	4.60	0.00	0.00	125.5	0.0	4.70	3.0	0	2.5	0
91	13	7	89.0	205.0	105.0	44.0	19.3	9.475	11.45	0.00	0.00	130.5	4.5	3.40	3.0	0	2.5	0
92	14	1	89.0	200.0	105.0	43.0	19.3	8.235	12.10	0.00	0.00	107.0	3.0	2.25	3.0	0	2.5	0
93	14	2	89.5	205.0	100.0	41.5	21.8	8.465	5.55	0.00	0.00	109.5	0.0	1.20	2.0	0	2.5	0
94	14	3	90.0	205.0	105.0	44.0	19.4	8.090	12.90	0.00	0.00	108.0	2.0	1.15	2.5	0	2.5	0
95	14	4	91.0	215.0	120.0	40.5	19.7	9.215	8.45	0.00	0.00	115.0	4.0	0.00	3.0	0	2.5	0
96	14	5	90.0	215.0	110.0	44.0	18.5	9.115	1.10	0.00	0.00	108.0	2.0	2.30	3.0	0	2.5	0
97	14	6	90.0	185.0	85.0	42.0	19.1	8.730	4.85	0.00	0.00	121.5	1.0	1.20	2.0	0	2.5	0
98	14	7	88.5	190.0	95.0	41.0	20.4	7.670	8.95	0.00	0.00	108.5	1.0	4.90	2.5	0	2.5	0
99	15	1	91.5	195.0	95.0	43.0	20.8	7.635	5.90	0.00	1.15	99.0	2.0	4.65	3.0	0	3.5	0
100	15	2	88.0	230.0	115.0	39.5	17.8	7.975	9.65	0.00	1.15	107.0	2.5	6.85	3.0	0	3.5	0
101	15	3	89.0	225.0	115.0	44.0	19.4	8.460	5.70	0.00	0.00	97.5	0.0	1.15	3.0	0	3.0	0
102	15	4	93.0	220.0	105.0	41.0	19.5	8.635	1.20	0.00	0.00	103.5	1.0	4.85	2.5	0	3.0	0
103	15	5	92.0	230.0	110.0	42.5	20.0	8.165	5.10	0.00	0.00	96.5	3.5	7.30	3.0	0	3.0	0
104	15	6	90.5	210.0	105.0	40.5	19.8	8.735	2.25	0.00	0.00	111.0	3.5	2.65	3.0	0	3.5	0
105	15	7	90.0	205.0	105.0	40.5	18.4	8.280	12.35	0.00	0.00	100.5	2.5	3.50	3.0	0	3.5	0
106	16	1	88.0	220.0	100.0	45.0	18.1	7.615	22.00	0.00	1.10	100.0	4.5	2.25	3.0	0	3.5	0
107	16	2	88.0	220.0	105.0	42.5	17.3	7.310	20.70	0.00	1.20	102.0	5.5	2.35	2.5	0	4.5	0
108	16	3	89.0	215.0	95.0	43.0	19.5	7.945	32.05	0.00	1.15	100.0	3.5	4.65	3.0	0	4.0	0
109	16	4	91.5	205.0	90.0	41.5	18.9	8.420	23.40	0.00	0.00	112.0	3.5	4.85	2.5	0	3.5	0
110	16	5	89.5	220.0	100.0	43.5	18.7	8.580	9.40	0.00	0.00	101.0	3.5	2.25	2.5	0	4.0	0
111	16	6	87.5	215.0	95.0	42.5	18.7	8.160	2.20	0.00	0.00	113.0	3.0	1.15	2.5	0	4.0	0
112	16	7	90.0	195.0	75.0	40.0	16.9	5.760	16.70	0.00	0.00	105.0	6.0	6.20	2.5	0	4.0	0
113	17	1	87.0	195.0	85.0	44.0	17.9	7.450	14.55	0.00	1.15	103.5	4.0	4.55	3.0	0	3.5	0
114	17	2	88.5	210.0	105.0	42.0	18.2	7.270	11.10	0.00	2.40	106.0	5.5	2.40	3.0	0	3.5	0
115	17	3	90.0	225.0	110.0	43.0	19.6	8.760	14.60	0.00	2.35	103.5	1.0	2.25	3.5	0	3.5	0
116	17	4	91.0	230.0	110.0	43.5	19.0	8.960	10.45	0.00	1.15	110.5	2.0	1.15	3.0	0	3.0	0
117	17	5	90.5	220.0	120.0	44.0	18.1	8.545	4.50	2.25	0.00	100.0	5.5	0.00	3.0	0	3.5	0
118	17	6	88.0	210.1	100.1	43.0	19.0	9.190	3.10	0.00	0.00	110.5	3.5	2.40	3.0	0	3.0	0
119	17	7	89.5	215.0	95.0	40.0	20.0	6.345	20.00	0.00	0.00	106.5	1.5	3.75	2.5	0	3.5	0
120	18	1	92.5	205.0	100.0	42.5	20.2	8.515	15.60	0.00	0.00	106.0	4.5	5.90	3.0	0	3.5	0

SAN JERONIMO 1990 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
121	18	2	92.5	180.0	90.0	20.0	19.2	3.750	2.50	2.65	0.00	102.5	1.5	3.95	3.0	0	3.5	0
122	18	3	94.0	185.0	85.0	5.0	19.4	1.195	7.15	0.00	0.00	146.0	0.0	0.00	3.0	0	4.0	0
123	18	4	96.5	200.0	105.0	42.0	21.0	8.300	0.00	1.25	0.00	111.5	2.0	3.75	2.5	0	3.5	0
124	18	5	94.0	210.0	120.0	44.0	19.6	9.030	2.85	0.00	0.00	120.0	2.0	1.15	3.0	0	3.5	0
125	18	6	93.5	195.0	95.0	44.0	19.5	8.630	0.00	7.95	0.00	108.0	1.0	6.80	3.0	0	3.0	0
126	18	7	94.0	175.0	80.0	18.5	20.3	3.705	0.00	0.00	0.00	157.0	0.0	2.85	3.0	0	3.0	0
127	19	1	90.5	210.0	105.0	44.0	20.7	8.730	11.45	0.00	0.00	97.5	3.0	5.65	3.0	0	3.0	0
128	19	2	90.5	205.0	105.0	44.0	19.9	8.405	9.65	0.00	0.00	105.5	4.5	9.05	2.5	0	3.5	0
129	19	3	94.0	210.0	105.0	44.0	19.8	8.595	8.20	3.40	1.15	96.5	3.5	2.30	3.0	0	3.0	0
130	19	4	93.5	230.0	125.0	43.5	19.9	9.265	3.20	4.65	0.00	108.0	3.0	2.25	2.5	0	3.0	0
131	19	5	91.5	225.0	120.0	41.5	19.3	8.555	7.05	0.00	0.00	102.5	4.5	3.60	3.0	0	3.5	0
132	19	6	91.0	200.0	100.0	43.5	22.2	9.095	8.35	2.20	0.00	110.5	5.5	4.65	3.0	0	3.0	0
133	19	7	90.5	205.0	100.0	43.5	20.2	9.110	10.15	0.00	0.00	100.0	1.0	1.15	2.5	0	3.0	0
134	20	1	90.5	210.0	100.0	44.0	20.4	8.125	7.45	0.00	0.00	91.0	2.5	5.75	2.5	0	3.5	0
135	20	2	89.5	205.0	100.0	44.0	19.6	7.190	9.55	0.00	0.00	95.5	2.5	3.40	3.0	0	3.5	0
136	20	3	92.0	210.0	120.0	38.5	19.7	6.495	5.45	0.00	1.30	95.0	3.0	9.10	3.0	0	3.0	0
137	20	4	93.0	205.0	100.0	42.0	21.6	8.765	1.20	0.00	0.00	97.5	1.0	5.95	3.0	0	3.0	0
138	20	5	92.0	210.0	110.0	41.5	18.7	8.390	4.80	0.00	0.00	100.0	1.0	1.30	3.5	0	3.0	0
139	20	6	91.0	205.0	95.0	43.5	19.5	8.165	4.55	0.00	0.00	101.0	1.0	3.50	3.0	0	3.5	0
140	20	7	90.5	205.0	110.0	42.5	18.2	8.110	0.00	0.00	0.00	103.5	1.0	2.35	3.0	0	3.0	0
141	21	1	92.0	215.0	100.0	42.5	18.4	7.395	6.50	0.00	0.00	107.0	6.5	2.35	3.0	0	3.5	0
142	21	2	92.5	225.0	115.0	29.0	18.3	5.775	6.85	0.00	0.00	124.5	7.5	0.00	3.0	0	3.5	0
143	21	3	90.5	230.0	105.0	37.5	19.3	8.105	17.95	0.00	0.00	114.5	3.5	0.00	2.5	0	3.0	0
144	21	4	92.0	215.0	105.0	43.0	20.0	8.800	12.25	0.00	0.00	114.0	2.0	3.55	2.5	0	3.0	0
145	21	5	94.0	210.0	115.0	43.5	18.2	9.235	2.95	0.00	0.00	115.0	3.0	2.35	3.0	0	3.5	0
146	21	6	91.5	220.0	110.0	36.0	19.6	8.295	3.00	0.00	0.00	135.5	1.0	4.05	2.5	0	3.0	0
147	21	7	92.0	210.0	100.0	34.0	18.7	7.180	6.75	0.00	1.55	136.0	6.5	6.25	2.5	0	3.5	0
148	22	1	93.5	180.0	80.0	27.0	15.9	4.275	7.15	0.00	0.00	100.0	28.0	10.95	3.0	0	3.5	0
149	22	2	91.0	210.0	105.0	40.0	19.3	6.970	4.55	0.00	0.00	110.0	7.0	6.35	2.5	0	3.5	0
150	22	3	91.0	190.0	105.0	21.0	19.0	4.480	1.45	0.00	0.00	128.5	3.0	6.40	2.5	0	3.0	0
151	22	4	97.5	210.0	105.0	40.5	23.9	7.065	3.70	0.00	0.00	102.5	7.0	8.60	2.5	0	3.5	0
152	22	5	95.0	190.1	105.1	19.0	21.8	3.965	2.70	0.00	1.45	119.5	15.0	2.85	3.0	0	3.5	0
153	22	6	91.0	210.0	105.0	38.0	17.5	8.700	0.95	0.00	0.00	126.5	2.0	6.55	3.0	0	3.5	0
154	22	7	95.5	185.0	75.0	32.0	16.6	4.975	1.15	0.00	0.00	91.5	33.5	9.75	3.5	0	4.0	0
155	23	1	95.0	210.0	90.0	27.5	21.0	6.020	0.00	0.00	0.00	106.5	5.5	2.50	3.0	0	4.0	0
156	23	2	90.0	195.0	90.0	42.5	21.6	8.405	11.70	0.00	0.00	100.0	2.5	1.20	2.5	0	3.5	0
157	23	3	92.0	210.0	110.0	23.5	20.3	4.585	2.65	0.00	0.00	112.0	1.5	6.50	3.0	0	4.0	0
158	23	4	95.0	215.0	110.0	40.5	20.4	9.035	7.60	0.00	0.00	114.0	2.0	1.15	2.5	0	4.0	0
159	23	5	95.0	235.0	115.0	35.0	22.3	7.305	3.55	2.80	0.00	117.0	7.5	1.40	3.0	0	3.0	0
160	23	6	89.5	180.0	80.0	30.5	21.3	5.610	12.65	0.00	0.00	107.5	3.0	8.15	3.5	0	5.0	0
161	23	7	96.5	240.0	135.0	44.0	23.0	9.210	8.65	0.00	0.00	119.0	5.0	4.55	2.0	0	3.0	0

CUYUTA 1990 (ENVIRONMENT No. 6)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
1	1	1	63.5	225.0	120.0	40.5	19.7	6.395	4.05	0.00	1.20	91.5	7.0	12.20	3.0	0	2.5	0
2	1	2	62.5	230.0	122.5	40.5	18.4	6.890	3.60	0.00	1.30	105.0	7.5	2.45	3.0	0	2.5	0
3	1	3	66.5	235.0	127.5	42.5	20.6	7.695	1.20	3.50	2.35	99.0	6.0	4.65	3.0	0	2.5	0
4	1	4	63.0	230.0	125.0	43.5	19.4	8.040	1.15	0.00	1.15	104.5	2.0	3.50	3.0	0	2.5	0
5	1	5	65.0	245.0	132.5	41.0	17.0	7.560	2.50	0.00	0.00	102.5	2.5	3.65	3.0	0	2.5	0
6	1	6	65.0	235.0	125.0	42.0	18.7	7.320	2.20	0.00	1.20	107.0	7.0	4.80	3.0	0	3.0	0
7	1	7	65.5	222.5	115.0	43.0	20.4	6.895	0.00	0.00	0.00	101.5	7.0	4.65	2.5	0	3.0	0
8	2	1	63.5	232.5	125.0	39.5	19.3	5.340	6.80	3.75	1.30	76.0	3.5	2.55	2.5	0	2.0	0
9	2	2	61.5	232.5	125.0	41.5	17.4	5.980	6.80	2.40	0.00	88.0	2.5	4.85	3.0	0	2.0	0
10	2	3	63.0	240.0	125.0	41.5	19.8	6.040	5.10	0.00	0.00	92.5	3.0	6.00	2.5	0	2.0	0
11	2	4	63.5	242.5	130.0	40.0	17.4	5.795	5.45	4.15	1.40	92.0	5.5	2.55	3.5	0	2.5	0
12	2	5	63.0	237.5	120.0	35.5	18.4	5.255	9.15	11.75	4.40	96.5	7.0	10.05	3.0	0	2.0	0
13	2	6	62.5	220.0	117.5	40.5	18.4	5.860	5.70	0.00	2.50	87.5	3.0	7.40	3.0	0	2.5	0
14	2	7	61.5	220.0	115.0	39.5	19.4	5.340	4.00	0.00	1.30	92.0	1.0	3.80	2.5	0	2.0	0
15	3	1	62.0	230.0	117.5	44.0	18.7	6.905	7.50	4.55	1.15	93.0	6.0	6.85	3.0	0	2.0	0
16	3	2	61.0	232.5	122.5	44.0	18.1	6.730	5.00	5.70	0.00	94.5	7.5	6.80	3.0	0	2.5	0
17	3	3	63.5	227.5	112.5	41.0	19.3	6.175	3.05	0.00	0.00	85.5	4.5	4.80	3.0	0	2.0	0
18	3	4	63.5	227.5	120.0	44.0	18.2	6.905	3.75	2.25	0.00	91.0	7.5	5.65	3.0	0	2.5	0
19	3	5	64.5	230.0	130.0	42.5	17.3	6.205	6.40	2.35	3.60	89.5	4.5	5.90	2.5	0	2.5	0
20	3	6	60.0	217.5	110.0	44.0	17.8	7.125	4.75	4.55	1.15	95.5	8.5	12.50	4.0	0	2.5	0
21	3	7	61.0	227.5	112.5	43.0	18.9	7.270	4.85	1.20	1.20	100.0	8.5	11.75	3.0	0	2.5	0
22	4	1	65.0	252.5	135.0	43.0	18.5	7.025	6.45	0.00	0.00	91.0	6.5	15.10	3.0	0	2.5	0
23	4	2	63.0	225.0	115.0	42.5	19.4	6.615	2.40	5.45	1.10	98.5	4.5	3.65	3.0	0	2.5	0
24	4	3	64.5	237.5	117.5	16.0	18.3	3.680	2.15	4.15	0.00	128.5	2.0	6.65	3.0	0	2.5	0
25	4	4	66.5	247.5	132.5	43.5	19.7	7.370	2.70	3.50	0.00	93.0	5.0	3.50	3.0	0	3.0	0
26	4	5	63.5	245.0	130.0	44.0	17.4	8.670	2.15	0.00	0.00	102.5	8.0	5.65	3.0	0	2.0	0
27	4	6	64.0	222.5	115.0	44.5	18.9	7.030	4.60	1.10	0.00	99.0	7.5	9.00	4.0	0	2.5	0
28	4	7	66.0	230.0	120.0	35.5	18.7	5.890	1.20	1.40	0.00	108.5	8.0	5.65	2.5	0	2.0	0
29	5	1	62.0	222.5	115.0	43.5	16.9	6.635	5.00	0.00	1.15	92.0	4.0	10.35	4.0	0	2.5	0
30	5	2	62.0	222.5	112.5	42.5	16.4	6.530	2.45	0.00	0.00	96.5	2.5	3.55	3.0	0	2.5	0
31	5	3	64.0	212.5	110.0	42.0	18.7	6.305	3.50	0.00	0.00	105.0	2.0	6.15	3.0	0	2.0	0
32	5	4	63.0	210.0	105.0	43.0	17.5	6.785	4.85	1.20	2.40	100.0	4.5	5.80	4.0	0	2.0	0
33	5	5	63.5	220.0	115.0	42.5	18.1	6.405	1.20	0.00	1.15	96.5	8.5	5.90	4.0	0	2.5	0
34	5	6	63.0	200.0	100.0	42.5	19.1	6.425	0.00	4.75	0.00	99.5	5.5	4.70	4.0	0	2.5	0
35	5	7	62.0	217.5	107.5	44.0	20.3	6.680	0.00	0.00	0.00	95.0	2.0	6.80	3.0	0	2.5	0
36	6	1	59.5	245.0	125.0	41.5	18.1	7.845	3.55	3.55	0.00	101.0	4.5	1.20	2.5	0	2.0	0
37	6	2	61.0	235.0	125.0	37.0	17.1	6.205	4.25	6.25	3.15	105.0	6.5	5.95	3.0	0	2.5	0
38	6	3	62.0	230.0	122.5	43.5	17.1	6.905	1.25	0.00	0.00	92.0	4.0	5.75	3.0	0	2.0	0
39	6	4	60.5	237.5	120.0	43.0	17.1	7.565	3.55	0.00	0.00	98.5	7.0	5.80	2.5	0	2.5	0
40	6	5	61.5	235.0	125.0	42.0	16.3	7.970	1.10	2.40	2.40	102.5	1.5	2.40	3.0	0	2.5	0

CUYUTA 1990 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
41	6	6	59.5	235.0	125.0	43.0	17.7	7.085	1.05	0.00	2.35	106.0	4.0	5.85	2.5	0	2.5	0
42	6	7	59.5	227.5	120.0	43.5	17.8	7.175	1.05	0.00	1.15	102.0	6.5	11.45	2.5	0	2.0	0
43	7	1	62.5	217.5	110.0	43.5	18.8	6.390	3.60	0.00	0.00	96.5	3.5	2.30	4.0	0	3.0	0
44	7	2	61.0	230.0	120.0	42.5	17.2	6.285	3.50	0.00	1.20	102.5	10.5	7.25	4.0	0	3.0	0
45	7	3	61.0	225.0	110.0	44.0	18.8	6.535	3.40	0.00	0.00	99.0	7.0	4.55	4.0	0	3.0	0
46	7	4	63.0	225.0	115.0	42.0	18.9	5.875	2.30	0.00	1.25	104.5	7.0	11.80	3.0	0	3.0	0
47	7	5	63.5	225.0	120.0	42.5	17.5	6.440	4.70	1.20	1.20	100.0	9.5	6.90	4.5	0	3.5	0
48	7	6	62.0	220.0	115.0	44.0	17.5	6.630	1.20	2.25	0.00	97.5	8.5	4.50	3.5	0	2.5	0
49	7	7	61.5	220.0	115.0	43.0	18.4	5.955	1.10	0.00	0.00	102.5	7.0	5.80	3.0	0	3.5	0
50	8	1	62.0	217.5	117.5	41.0	16.6	6.190	1.20	0.00	0.00	101.0	4.5	1.20	3.5	0	3.0	0
51	8	2	61.5	232.5	127.5	42.5	16.7	6.885	5.95	0.00	0.00	99.0	4.5	2.35	4.0	0	2.5	0
52	8	3	61.5	220.0	120.0	44.0	18.1	6.350	0.00	0.00	0.00	99.0	6.5	3.40	4.0	0	2.5	0
53	8	4	62.0	242.5	130.0	44.0	17.2	7.080	0.00	0.00	1.15	101.0	4.5	3.40	4.0	0	3.0	0
54	8	5	62.5	235.0	127.5	41.0	16.5	6.330	2.45	0.00	0.00	99.0	7.5	7.40	4.5	0	4.0	0
55	8	6	62.5	215.0	115.0	41.5	17.9	6.880	3.40	0.00	0.00	108.5	1.0	4.85	4.0	0	2.5	0
56	8	7	61.0	215.0	115.0	40.5	18.6	6.220	0.00	0.00	0.00	99.0	5.0	10.10	4.0	0	3.0	0
57	9	1	62.5	237.5	125.0	43.0	18.4	6.985	4.95	0.00	0.00	95.5	7.5	3.50	4.0	0	2.0	0
58	9	2	62.0	252.5	140.0	43.5	18.7	6.255	1.25	0.00	0.00	91.0	7.5	6.90	4.0	0	2.0	0
59	9	3	63.5	247.5	130.0	44.0	18.3	5.965	1.30	0.00	1.15	84.5	4.5	7.95	3.5	0	2.0	0
60	9	4	64.5	245.0	137.5	43.5	18.4	6.885	2.35	1.15	0.00	95.5	7.5	4.55	3.0	0	2.0	0
61	9	5	63.0	252.5	140.0	42.5	16.9	7.535	2.25	0.00	1.15	105.0	4.5	5.95	3.0	0	2.5	0
62	9	6	64.0	232.5	122.5	43.5	17.8	6.605	2.20	1.15	0.00	97.5	5.0	6.95	3.5	0	2.0	0
63	9	7	63.0	220.0	112.5	40.5	19.6	6.605	3.75	0.00	0.00	99.0	3.0	3.70	3.5	0	2.0	0
64	10	1	61.0	230.0	122.5	43.0	17.9	6.780	3.45	1.20	0.00	99.0	7.0	8.10	3.0	0	2.0	0
65	10	2	60.0	237.5	130.0	43.0	16.7	8.125	1.10	1.20	0.00	101.0	3.0	1.20	2.5	0	2.0	0
66	10	3	59.5	245.0	122.5	44.0	17.6	7.515	2.15	0.00	0.00	104.5	3.0	4.50	3.5	0	2.0	0
67	10	4	60.5	237.5	130.0	43.5	18.0	7.295	0.00	3.40	0.00	98.0	2.0	2.35	3.0	0	2.5	0
68	10	5	64.0	245.0	135.0	43.5	16.7	7.550	2.25	4.65	1.15	97.5	2.5	2.25	3.0	0	2.0	0
69	10	6	61.5	225.0	112.5	43.0	17.4	7.350	3.65	0.00	0.00	95.5	1.5	2.30	3.5	0	2.5	0
70	10	7	60.0	225.0	115.0	42.0	18.2	7.275	3.70	1.15	0.00	98.0	5.0	4.70	2.5	0	2.5	0
71	11	1	61.0	230.0	115.0	43.0	18.2	7.230	2.40	2.40	0.00	97.5	3.5	1.15	2.5	0	2.0	0
72	11	2	60.5	242.5	122.5	44.0	19.0	7.865	2.40	0.00	0.00	95.0	2.0	2.25	2.5	0	2.0	0
73	11	3	63.0	232.5	122.5	44.5	17.9	6.875	4.40	0.00	0.00	89.5	2.0	4.45	2.5	0	2.0	0
74	11	4	62.0	237.5	125.0	43.0	17.5	7.535	2.10	0.00	1.20	101.0	1.0	4.70	3.0	0	2.0	0
75	11	5	62.5	245.0	132.5	44.0	17.6	7.195	1.15	5.70	0.00	98.0	3.5	5.70	2.5	0	2.5	0
76	11	6	62.0	225.0	115.0	43.0	17.7	6.425	1.15	1.15	0.00	93.0	2.5	5.85	3.0	0	2.0	0
77	11	7	63.0	222.5	110.0	43.0	18.0	7.075	0.00	0.00	0.00	96.5	2.5	7.10	2.5	0	2.0	0
78	12	1	62.0	222.5	122.5	43.0	18.4	6.790	5.20	0.00	1.20	93.0	5.0	4.70	3.0	0	2.0	0
79	12	2	60.5	230.0	125.0	41.0	16.3	7.170	4.90	3.80	0.00	96.5	1.5	1.30	3.0	0	2.0	0
80	12	3	62.5	227.5	120.0	43.5	17.2	6.475	0.00	0.00	0.00	95.0	6.0	5.75	3.5	0	2.0	0

CUYUTA 1990 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
81	12	4	63.5	230.0	120.0	17.0	18.0	4.220	2.10	0.00	0.00	124.5	0.0	3.55	3.0	0	2.5	0
82	12	5	62.5	252.5	135.0	43.0	17.1	7.235	1.25	1.20	1.20	93.0	3.0	4.60	3.0	0	2.0	0
83	12	6	61.0	207.5	107.5	40.0	17.1	6.810	1.45	0.00	0.00	92.0	1.5	2.65	3.0	0	2.0	0
84	12	7	61.5	235.0	130.0	43.5	17.9	7.680	2.35	1.15	0.00	99.0	2.5	4.65	3.0	0	2.0	0
85	13	1	62.5	230.0	122.5	44.0	18.0	7.525	1.20	0.00	0.00	97.5	5.0	4.55	3.0	0	2.0	0
86	13	2	62.0	235.0	130.0	37.0	19.0	6.145	1.50	0.00	0.00	96.0	4.0	5.45	2.5	0	2.0	0
87	13	3	63.5	215.0	115.0	16.5	19.0	3.650	6.00	0.00	0.00	116.0	7.5	6.20	2.5	0	3.0	0
88	13	4	63.0	222.5	130.0	44.0	17.7	7.365	4.80	0.00	0.00	95.5	7.0	5.70	3.0	0	3.0	0
89	13	5	61.5	235.0	135.0	43.5	17.5	7.765	2.15	1.15	0.00	99.0	1.0	3.40	3.5	0	2.5	0
90	13	6	61.0	217.5	120.0	41.0	19.0	7.760	3.20	0.00	0.00	112.0	5.5	3.70	2.5	0	2.5	0
91	13	7	64.0	220.0	117.5	43.5	18.5	6.780	2.35	0.00	0.00	98.0	8.5	12.60	3.0	0	3.0	0
92	14	1	61.0	217.5	115.0	43.0	17.1	7.000	1.10	0.00	0.00	98.5	3.5	4.65	3.5	0	2.0	0
93	14	2	61.0	227.5	125.0	41.5	18.1	6.585	1.30	1.20	0.00	100.0	4.0	8.40	3.5	0	2.0	0
94	14	3	60.5	212.5	110.0	43.0	18.2	7.185	2.25	0.00	0.00	101.0	7.0	1.15	3.0	0	2.0	0
95	14	4	61.0	227.5	120.0	43.5	18.3	7.645	3.40	0.00	0.00	101.0	6.0	5.70	3.5	0	2.5	0
96	14	5	60.5	237.5	125.0	43.5	18.2	7.090	0.00	0.00	2.35	102.5	5.5	5.80	3.5	0	3.0	0
97	14	6	60.5	215.0	110.0	44.0	18.2	7.230	4.65	1.15	1.15	95.5	4.0	6.80	3.5	0	2.0	0
98	14	7	61.0	205.0	107.5	44.5	18.3	7.275	0.00	0.00	0.00	96.5	3.0	4.45	3.0	0	2.0	0
99	15	1	63.5	220.0	115.0	42.0	17.5	6.915	1.20	3.50	0.00	100.0	0.0	1.15	3.0	0	2.0	0
100	15	2	59.5	240.0	132.5	39.5	18.7	7.185	0.00	0.00	0.00	102.5	2.5	1.45	3.0	0	2.0	0
101	15	3	62.5	235.0	130.0	29.0	17.9	4.650	3.55	0.00	0.00	95.5	2.5	2.25	3.5	0	2.0	0
102	15	4	61.5	245.0	125.0	43.0	18.7	7.465	0.00	1.15	3.50	91.5	1.0	5.85	3.0	0	2.5	0
103	15	5	62.5	255.0	142.5	42.0	18.1	7.800	2.15	3.55	0.00	108.5	2.0	0.00	3.5	0	2.5	0
104	15	6	61.5	222.5	117.5	38.0	18.0	6.540	1.15	4.55	0.00	103.0	2.5	3.85	4.0	0	2.5	0
105	15	7	61.5	230.0	120.0	39.5	18.9	7.080	1.15	0.00	0.00	96.0	2.5	2.60	3.0	0	2.0	0
106	16	1	63.5	220.0	115.0	43.5	17.9	6.825	2.35	4.55	0.00	95.5	5.0	6.85	2.5	0	2.5	0
107	16	2	62.0	225.0	125.0	44.0	17.5	7.010	2.25	0.00	0.00	102.0	4.5	7.95	3.0	0	3.0	0
108	16	3	62.0	230.0	122.5	44.0	17.6	7.425	1.15	0.00	0.00	96.5	3.5	1.15	3.0	0	2.5	0
109	16	4	63.0	220.0	115.0	44.0	18.0	7.670	0.00	0.00	0.00	97.5	2.5	4.55	3.0	0	3.0	0
110	16	5	63.5	230.0	125.0	43.0	16.9	6.920	0.00	3.40	0.00	97.5	4.5	6.95	2.5	0	3.0	0
111	16	6	61.5	217.5	115.0	44.0	19.2	7.000	2.45	1.15	3.40	96.5	5.0	2.30	3.5	0	3.0	0
112	16	7	62.5	205.0	100.0	42.5	19.3	6.075	3.60	0.00	0.00	100.0	6.0	4.75	3.5	0	3.0	0
113	17	1	61.0	220.0	110.0	43.0	17.9	5.820	6.25	0.00	1.20	81.0	5.0	9.30	3.0	0	2.5	0
114	17	2	60.5	232.5	120.0	43.5	17.5	7.480	3.55	0.00	2.30	100.0	2.0	2.30	3.5	0	3.0	0
115	17	3	63.5	220.0	110.0	41.0	18.6	6.550	5.25	0.00	0.00	94.0	1.0	2.45	2.5	0	2.0	0
116	17	4	63.0	230.0	120.0	44.0	18.4	8.060	1.15	6.80	0.00	96.5	1.0	5.70	2.0	0	3.0	0
117	17	5	64.0	235.0	115.0	40.5	17.6	4.795	4.75	0.00	2.45	77.0	6.0	9.90	3.0	0	3.0	0
118	17	6	62.0	220.0	110.0	38.0	18.3	6.445	2.80	14.05	0.00	103.0	1.5	6.10	2.5	0	2.5	0
119	17	7	62.0	207.5	105.0	40.5	19.1	5.675	3.80	0.00	0.00	96.5	4.5	7.25	2.5	0	3.0	0
120	18	1	65.5	225.0	125.0	44.5	18.3	6.895	4.65	3.35	0.00	94.5	7.5	7.80	4.0	0	3.5	0

CUYUTA 1990 (CONTINUATION)

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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
121	18	2	62.0	235.0	122.5	41.0	18.1	6.540	3.70	2.45	0.00	99.0	12.5	6.30	3.5	0	3.0	0
122	18	3	65.0	212.5	102.5	15.5	19.6	3.210	2.95	0.00	0.00	113.5	6.0	0.00	2.5	0	3.0	0
123	18	4	64.5	235.0	125.0	44.0	18.2	7.465	2.30	0.00	0.00	100.0	0.0	4.55	4.0	0	3.5	0
124	18	5	63.0	237.5	130.0	43.5	17.8	7.730	0.00	0.00	0.00	99.0	0.0	4.60	4.5	0	3.5	0
125	18	6	63.0	227.5	122.5	43.0	18.5	7.385	0.00	9.30	2.35	101.5	0.0	10.65	4.5	0	3.0	0
126	18	7	63.0	220.0	112.5	40.0	19.3	6.900	1.45	0.00	0.00	87.5	1.5	3.85	3.5	0	3.5	0
127	19	1	62.0	235.0	122.5	43.5	19.0	6.995	5.10	1.15	1.15	91.0	6.5	2.30	3.0	0	2.5	0
128	19	2	61.5	227.5	115.0	42.0	18.7	6.495	6.15	3.55	2.40	96.0	7.0	3.60	3.0	0	2.5	0
129	19	3	61.5	235.0	125.0	42.5	17.5	6.355	5.25	1.15	0.00	90.0	8.0	3.45	3.5	0	2.0	0
130	19	4	62.5	240.0	127.5	43.5	19.7	7.880	2.25	1.15	0.00	102.5	4.5	2.35	3.0	0	2.5	0
131	19	5	62.0	230.0	122.5	40.0	18.0	6.690	2.55	0.00	1.20	97.5	5.5	3.75	3.5	0	3.0	0
132	19	6	61.0	217.5	110.0	43.5	18.6	7.655	1.20	0.00	1.15	102.0	5.5	3.50	3.0	0	2.5	0
133	19	7	60.0	227.5	112.5	44.0	18.2	7.000	2.95	2.25	0.00	88.5	16.5	3.40	3.0	0	2.0	0
134	20	1	64.0	220.0	120.0	42.0	18.5	6.965	1.15	1.20	0.00	94.0	2.5	5.95	3.5	0	2.0	0
135	20	2	61.0	225.0	120.0	43.0	18.1	7.010	3.60	1.15	0.00	96.5	1.0	2.25	3.0	0	2.0	0
136	20	3	64.0	225.0	115.0	42.0	18.3	6.095	5.20	1.20	0.00	91.5	4.0	8.30	4.0	0	2.0	0
137	20	4	64.0	230.0	117.5	43.0	18.4	7.540	1.15	2.25	1.20	100.0	1.0	5.80	3.0	0	2.0	0
138	20	5	61.0	235.0	120.0	44.0	17.4	7.390	3.20	2.25	0.00	105.5	4.0	2.25	3.0	0	2.0	0
139	20	6	61.0	220.0	120.0	42.0	18.4	7.165	2.65	2.40	0.00	92.5	1.5	4.75	4.0	0	2.0	0
140	20	7	61.0	220.0	110.0	41.5	19.6	6.835	0.00	0.00	1.20	91.5	0.0	6.10	3.0	0	2.0	0
141	21	1	63.5	227.5	120.0	42.5	17.7	5.865	1.30	0.00	1.25	94.0	5.0	5.70	4.0	0	2.5	0
142	21	2	61.0	222.5	115.0	39.0	16.9	5.740	4.00	1.35	0.00	97.5	4.0	2.55	3.0	0	2.5	0
143	21	3	63.0	230.0	122.5	42.0	17.9	5.900	3.85	0.00	0.00	92.0	6.5	4.70	3.0	0	2.0	0
144	21	4	63.0	227.5	120.0	44.0	17.7	6.345	0.00	0.00	0.00	99.0	6.0	6.80	3.5	0	3.0	0
145	21	5	63.0	230.0	127.5	42.0	17.8	6.145	0.00	3.65	0.00	99.0	1.0	2.50	3.5	0	2.0	0
146	21	6	62.5	225.0	120.0	39.0	18.7	6.625	0.00	0.00	0.00	108.0	5.0	1.30	3.5	0	2.5	0
147	21	7	63.0	227.5	120.0	37.0	18.3	5.640	1.30	0.00	0.00	101.0	5.5	5.40	3.0	0	2.5	0
148	22	1	62.5	235.0	117.5	35.0	18.0	7.670	2.70	0.00	0.00	105.5	1.5	1.45	3.0	0	2.0	0
149	22	2	61.0	245.0	122.5	44.0	17.1	8.460	0.00	2.25	0.00	107.0	4.0	4.55	3.0	0	2.5	0
150	22	3	62.5	225.0	112.5	41.5	18.2	7.555	1.30	0.00	0.00	96.5	2.5	2.45	3.0	0	2.0	0
151	22	4	64.0	200.0	100.0	37.0	17.2	4.965	1.20	0.00	0.00	92.0	8.5	13.30	3.5	0	3.0	0
152	22	5	66.0	232.5	115.0	27.0	18.2	4.710	1.30	0.00	0.00	103.5	0.0	3.55	2.5	0	3.0	0
153	22	6	62.0	225.0	115.0	44.0	17.3	7.825	0.00	0.00	0.00	111.5	4.0	5.70	3.5	0	3.5	0
154	22	7	64.0	190.0	90.0	15.5	16.3	1.385	1.90	0.00	0.00	123.0	23.0	16.65	4.5	0	3.0	0
155	23	1	64.0	215.0	110.0	38.5	17.8	5.860	1.50	2.80	0.00	86.0	4.5	6.30	2.5	0	2.5	0
156	23	2	63.0	217.5	110.0	42.0	17.9	7.255	1.30	0.00	0.00	97.5	5.0	2.35	2.5	0	2.5	0
157	23	3	64.0	222.5	120.0	35.0	17.7	5.960	4.60	2.50	0.00	97.5	3.0	6.25	3.0	0	2.5	0
158	23	4	66.0	210.0	105.0	39.0	18.1	5.420	6.05	0.00	0.00	92.0	9.0	10.35	2.5	0	2.0	0
159	23	5	67.0	220.0	117.5	37.5	19.1	5.440	4.70	8.00	1.40	88.0	6.0	12.40	3.0	0	2.5	0
160	23	6	63.0	200.0	100.0	41.0	18.6	6.035	4.00	0.00	0.00	94.0	6.5	5.10	3.0	0	3.0	0
161	23	7	66.5	237.5	125.0	40.0	19.4	6.715	3.75	0.00	0.00	107.5	6.0	5.00	3.0	0	2.5	0

ZACAPA 1990 (ENVIRONMENT No. 7)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
1	1	1	63.5	207.5	101.0	40.0	23.5	7.995	5.55	0.00	0.00	95.0	3.0	0	0	0	0	0
2	1	2	64.0	219.0	115.0	39.5	23.6	6.060	1.15	5.15	1.40	95.5	2.5	0	0	0	0	0
3	1	3	66.0	213.5	113.0	43.0	22.7	7.450	1.20	0.00	0.00	94.0	2.5	0	0	0	0	0
4	1	4	63.5	207.5	106.0	42.0	24.0	7.805	2.50	2.25	0.00	95.5	2.5	0	0	0	0	0
5	1	5	63.0	222.5	121.0	43.0	21.5	7.965	3.60	25.00	0.00	97.5	2.0	0	0	0	0	0
6	1	6	65.0	211.0	112.5	41.5	23.7	7.530	0.00	0.00	0.00	96.0	2.5	0	0	0	0	0
7	1	7	62.5	217.0	109.5	43.0	22.6	7.280	1.25	0.00	0.00	94.0	2.5	0	0	0	0	0
8	2	1	61.0	219.0	110.5	40.0	23.9	7.380	22.95	2.40	0.00	100.0	2.5	0	0	0	0	0
9	2	2	61.0	209.5	102.5	36.5	24.3	7.035	12.90	6.70	2.65	95.0	3.0	0	0	0	0	0
10	2	3	61.5	217.5	105.0	40.0	23.5	6.845	24.20	7.00	0.00	97.5	2.5	0	0	0	0	0
11	2	4	65.0	225.0	115.5	42.5	24.0	6.665	21.10	11.65	1.15	92.0	2.5	0	0	0	0	0
12	2	5	62.0	221.0	114.0	30.0	21.9	5.955	15.50	15.05	0.00	97.5	3.5	0	0	0	0	0
13	2	6	60.5	208.5	104.5	39.5	22.8	6.995	12.80	5.05	0.00	99.0	3.0	0	0	0	0	0
14	2	7	60.0	214.0	110.0	39.0	25.2	6.825	10.50	0.00	0.00	96.0	3.0	0	0	0	0	0
15	3	1	61.5	210.0	107.5	43.0	21.6	7.420	6.30	27.95	1.15	90.5	3.0	0	0	0	0	0
16	3	2	63.5	209.0	107.5	43.5	21.7	6.505	4.75	38.00	1.15	91.0	2.5	0	0	0	0	0
17	3	3	61.0	207.5	105.0	43.5	21.7	7.640	3.65	6.90	1.15	95.0	2.0	0	0	0	0	0
18	3	4	62.5	194.0	102.5	43.5	22.8	7.475	8.05	17.45	0.00	100.0	2.0	0	0	0	0	0
19	3	5	63.5	205.0	100.0	42.5	20.1	7.060	8.40	31.90	2.40	98.0	2.0	0	0	0	0	0
20	3	6	61.0	194.0	97.5	43.5	21.5	8.055	7.05	34.70	0.00	97.5	2.0	0	0	0	0	0
21	3	7	60.0	197.5	102.5	41.5	21.7	7.775	1.20	2.40	1.20	98.0	2.5	0	0	0	0	0
22	4	1	64.5	220.0	107.5	42.5	21.3	8.215	3.55	4.70	0.00	99.0	2.0	0	0	0	0	0
23	4	2	64.0	230.0	112.5	44.0	19.2	8.300	4.65	7.95	0.00	92.0	2.5	0	0	0	0	0
24	4	3	66.0	232.0	119.0	29.0	19.8	4.960	5.00	4.20	0.00	83.0	5.0	0	0	0	0	0
25	4	4	64.5	210.0	102.5	43.0	20.7	7.730	4.15	2.25	1.20	83.5	3.0	0	0	0	0	0
26	4	5	63.5	210.0	105.0	42.5	19.3	8.565	1.10	10.55	0.00	105.0	2.0	0	0	0	0	0
27	4	6	64.0	200.0	105.0	41.5	20.4	7.635	0.00	0.00	1.15	102.5	2.0	0	0	0	0	0
28	4	7	63.0	212.5	102.5	33.5	22.1	6.660	2.85	0.00	0.00	95.5	3.0	0	0	0	0	0
29	5	1	63.5	201.5	95.0	44.0	22.2	7.765	7.90	9.10	0.00	89.5	2.5	0	0	0	0	0
30	5	2	63.0	209.0	100.0	43.0	24.3	7.665	3.75	1.15	0.00	92.0	2.5	0	0	0	0	0
31	5	3	61.5	201.0	99.5	44.0	22.1	7.900	7.30	2.25	1.15	93.0	2.0	0	0	0	0	0
32	5	4	64.0	207.0	97.5	44.0	22.8	7.485	6.90	9.05	0.00	99.0	2.0	0	0	0	0	0
33	5	5	63.0	210.0	111.0	41.5	24.2	6.835	2.95	13.80	0.00	88.0	3.0	0	0	0	0	0
34	5	6	61.5	210.5	103.0	44.0	24.5	7.830	5.95	28.40	0.00	95.0	2.0	0	0	0	0	0
35	5	7	62.5	203.5	99.0	44.0	21.7	8.135	2.40	0.00	0.00	94.0	2.0	0	0	0	0	0
36	6	1	60.5	206.0	102.5	44.0	20.9	7.670	8.60	4.55	0.00	94.5	2.5	0	0	0	0	0
37	6	2	58.5	210.0	112.5	42.5	23.2	7.660	3.40	16.45	1.20	102.0	2.0	0	0	0	0	0
38	6	3	60.0	207.5	105.0	44.0	23.3	7.340	1.15	9.10	0.00	95.5	2.0	0	0	0	0	0
39	6	4	62.5	217.5	112.5	43.5	23.2	6.965	2.25	28.50	1.15	92.0	2.5	0	0	0	0	0
40	6	5	62.0	213.5	117.5	41.5	22.8	7.005	0.00	27.45	0.00	89.0	3.0	0	0	0	0	0

ZACAPA 1990 (CONTINUATION)
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
41	6	6	59.5	208.5	105.0	44.0	22.6	7.980	1.15	29.55	0.00	100.0	2.0	0	0	0	0	0
42	6	7	59.5	202.5	110.0	43.0	22.4	7.475	0.00	11.75	2.35	97.5	2.5	0	0	0	0	0
43	7	1	61.0	208.0	109.0	43.5	21.2	6.875	9.70	8.05	2.25	84.0	3.0	0	0	0	0	0
44	7	2	60.5	204.5	104.5	42.0	24.6	7.300	5.40	16.35	0.00	97.5	2.5	0	0	0	0	0
45	7	3	63.0	203.5	103.5	44.0	23.2	6.405	3.75	13.65	0.00	89.5	2.5	0	0	0	0	0
46	7	4	63.5	208.5	103.0	44.0	21.7	7.150	8.90	9.05	2.25	101.0	2.0	0	0	0	0	0
47	7	5	63.5	207.5	105.0	42.5	23.4	6.570	11.05	14.00	0.00	94.0	2.5	0	0	0	0	0
48	7	6	61.5	202.5	102.0	44.0	23.1	7.100	4.70	12.50	2.25	96.5	2.0	0	0	0	0	0
49	7	7	61.0	212.5	107.0	43.5	23.5	7.370	2.35	4.60	1.15	97.5	2.5	0	0	0	0	0
50	8	1	62.0	210.0	105.0	44.0	21.7	8.210	5.50	6.80	1.15	103.5	2.0	0	0	0	0	0
51	8	2	61.5	210.0	110.0	43.5	18.5	7.590	3.70	3.50	0.00	93.0	2.5	0	0	0	0	0
52	8	3	62.5	210.0	100.0	44.0	23.3	8.050	2.20	2.25	0.00	102.0	2.0	0	0	0	0	0
53	8	4	62.0	207.5	102.5	43.5	22.6	8.080	1.15	4.55	0.00	94.0	2.5	0	0	0	0	0
54	8	5	62.0	208.5	108.5	44.0	22.2	7.095	0.00	3.40	0.00	91.0	3.0	0	0	0	0	0
55	8	6	61.0	205.0	100.0	41.5	23.7	7.615	3.55	4.65	1.25	100.0	2.0	0	0	0	0	0
56	8	7	61.0	207.5	105.0	42.5	23.7	7.700	0.00	2.25	0.00	95.5	2.5	0	0	0	0	0
57	9	1	67.0	215.5	107.0	41.5	20.5	6.045	1.50	4.65	2.35	90.5	2.5	0	0	0	0	0
58	9	2	65.5	220.0	107.5	41.5	20.0	6.220	6.35	5.15	0.00	97.0	2.5	0	0	0	0	0
59	9	3	67.0	207.5	106.0	39.5	20.7	5.500	4.20	10.55	1.15	96.0	2.5	0	0	0	0	0
60	9	4	67.0	209.5	96.5	43.5	23.0	6.255	2.40	14.90	1.15	95.0	2.5	0	0	0	0	0
61	9	5	65.0	210.0	106.0	42.5	22.0	6.445	3.40	27.25	4.90	101.0	2.0	0	0	0	0	0
62	9	6	67.5	214.0	106.5	44.0	22.7	6.130	2.50	67.05	0.00	92.0	2.5	0	0	0	0	0
63	9	7	65.5	217.5	110.0	36.0	22.5	6.320	1.40	3.75	0.00	96.5	3.0	0	0	0	0	0
64	10	1	61.5	222.5	107.5	42.5	21.1	7.970	0.00	4.75	1.15	101.0	2.0	0	0	0	0	0
65	10	2	58.5	227.5	112.5	44.0	21.9	7.835	1.15	18.15	0.00	95.5	2.5	0	0	0	0	0
66	10	3	60.5	217.5	112.5	42.0	22.3	7.530	3.50	2.40	0.00	102.0	2.0	0	0	0	0	0
67	10	4	62.5	217.5	110.0	43.5	20.6	7.880	0.00	11.45	0.00	96.5	2.0	0	0	0	0	0
68	10	5	61.5	230.0	117.5	43.0	22.2	7.540	0.00	11.35	2.40	94.0	2.5	0	0	0	0	0
69	10	6	61.5	215.0	102.5	44.5	24.2	7.645	1.10	11.10	0.00	100.0	2.0	0	0	0	0	0
70	10	7	60.5	201.5	102.5	43.0	21.6	8.045	0.00	5.70	0.00	98.0	2.0	0	0	0	0	0
71	11	1	60.5	218.0	113.0	44.0	23.3	7.565	3.40	6.80	0.00	99.0	2.0	0	0	0	0	0
72	11	2	61.0	214.0	110.5	40.0	23.2	6.825	7.40	10.45	0.00	83.5	3.5	0	0	0	0	0
73	11	3	61.5	228.0	115.0	40.5	23.3	6.495	12.00	2.25	0.00	95.0	2.5	0	0	0	0	0
74	11	4	62.5	211.5	105.5	44.0	21.2	7.445	8.85	14.75	0.00	102.5	2.0	0	0	0	0	0
75	11	5	63.0	218.0	111.5	44.0	21.8	7.935	1.20	7.95	0.00	94.0	2.0	0	0	0	0	0
76	11	6	61.0	212.5	107.0	43.5	22.4	7.890	9.10	5.80	0.00	99.0	2.0	0	0	0	0	0
77	11	7	60.5	212.5	106.5	40.5	22.5	7.890	3.85	2.50	0.00	100.0	2.5	0	0	0	0	0
78	12	1	62.0	215.5	107.5	43.0	23.7	8.060	3.55	1.20	0.00	99.0	2.0	0	0	0	0	0
79	12	2	62.0	222.5	107.0	42.5	22.7	7.710	2.35	0.00	0.00	100.0	2.0	0	0	0	0	0
80	12	3	61.5	220.5	108.0	43.5	22.9	7.495	1.30	9.10	0.00	93.0	2.5	0	0	0	0	0

ZACAPA 1990 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
81	12	4	65.0	238.0	122.0	28.0	19.3	5.470	9.10	0.00	0.00	100.0	5.0	0	0	0	0	0
82	12	5	62.0	222.5	113.0	45.0	19.9	7.630	2.35	5.70	0.00	94.0	2.0	0	0	0	0	0
83	12	6	63.5	209.0	105.0	40.5	21.4	6.440	0.00	21.85	0.00	96.0	2.5	0	0	0	0	0
84	12	7	61.5	219.0	109.5	44.0	23.4	8.155	1.15	4.50	0.00	97.5	2.0	0	0	0	0	0
85	13	1	61.0	205.0	107.5	43.0	22.8	8.855	10.40	0.00	0.00	96.5	2.5	0	0	0	0	0
86	13	2	62.0	205.0	112.5	36.0	23.6	6.410	8.25	11.45	1.30	101.0	3.0	0	0	0	0	0
87	13	3	65.0	224.0	118.0	27.0	19.9	5.020	5.00	4.50	0.00	91.0	5.0	0	0	0	0	0
88	13	4	62.5	202.5	107.5	44.0	22.9	7.915	4.85	20.45	2.25	93.0	2.0	0	0	0	0	0
89	13	5	61.5	210.0	107.5	44.0	22.4	8.715	4.90	11.35	0.00	94.5	2.5	0	0	0	0	0
90	13	6	61.0	196.5	95.0	43.5	23.8	8.415	5.10	5.80	0.00	90.5	2.5	0	0	0	0	0
91	13	7	62.0	197.5	100.0	43.5	23.4	8.815	1.05	12.50	0.00	104.5	2.0	0	0	0	0	0
92	14	1	62.5	207.5	110.0	44.0	24.3	8.425	9.45	0.00	0.00	96.5	2.0	0	0	0	0	0
93	14	2	63.0	198.5	112.5	40.5	25.0	7.575	2.50	18.65	0.00	100.0	2.5	0	0	0	0	0
94	14	3	62.0	196.0	100.0	42.5	22.4	7.615	4.85	2.40	0.00	96.5	2.0	0	0	0	0	0
95	14	4	62.0	203.5	100.0	44.0	22.5	8.960	6.70	10.20	0.00	101.0	2.0	0	0	0	0	0
96	14	5	65.0	210.0	112.5	44.0	25.3	7.455	2.65	46.55	0.00	90.5	2.5	0	0	0	0	0
97	14	6	61.5	185.0	95.0	43.0	22.8	7.920	1.20	4.65	0.00	96.5	2.0	0	0	0	0	0
98	14	7	62.0	195.0	100.0	41.5	24.8	7.750	7.45	4.90	0.00	98.0	2.5	0	0	0	0	0
99	15	1	61.5	225.0	117.5	43.5	19.9	7.495	1.15	0.00	0.00	95.5	2.5	0	0	0	0	0
100	15	2	60.0	230.0	112.5	42.5	21.4	8.060	1.25	1.20	1.15	96.5	2.5	0	0	0	0	0
101	15	3	61.0	208.5	105.0	44.0	21.8	7.245	2.40	14.80	0.00	94.0	2.0	0	0	0	0	0
102	15	4	63.5	220.0	115.0	43.5	21.7	7.500	1.20	18.45	0.00	98.5	2.0	0	0	0	0	0
103	15	5	60.5	225.0	120.0	43.0	22.0	7.825	0.00	2.25	0.00	101.0	2.0	0	0	0	0	0
104	15	6	60.0	213.5	107.5	44.0	21.6	7.560	0.00	6.80	1.15	96.5	2.0	0	0	0	0	0
105	15	7	61.5	225.0	110.0	42.5	21.6	7.700	0.00	24.05	0.00	97.5	2.0	0	0	0	0	0
106	16	1	62.5	205.0	97.5	44.0	20.3	6.710	8.95	0.00	0.00	89.0	2.5	0	0	0	0	0
107	16	2	60.5	196.0	97.5	43.5	21.3	8.490	0.85	0.00	3.40	120.0	2.0	0	0	0	0	0
108	16	3	61.0	205.0	100.0	42.0	20.7	8.650	3.85	0.00	0.00	111.0	2.0	0	0	0	0	0
109	16	4	61.5	207.5	95.0	43.5	22.7	7.840	1.15	0.00	0.00	99.0	2.0	0	0	0	0	0
110	16	5	61.5	217.5	107.5	43.5	21.0	8.125	0.00	5.75	0.00	94.0	2.5	0	0	0	0	0
111	16	6	61.5	195.0	91.0	43.5	21.1	7.325	1.20	2.35	0.00	94.5	2.5	0	0	0	0	0
112	16	7	62.0	192.5	85.0	43.5	20.1	5.785	4.70	0.00	0.00	87.0	2.5	0	0	0	0	0
113	17	1	63.5	201.5	101.0	43.5	20.5	6.965	4.95	2.25	0.00	92.0	2.5	0	0	0	0	0
114	17	2	63.5	206.5	101.5	42.5	22.7	5.725	3.70	2.40	0.00	94.0	2.5	0	0	0	0	0
115	17	3	65.0	211.5	99.0	43.5	22.7	6.650	3.95	6.80	0.00	91.5	2.5	0	0	0	0	0
116	17	4	64.5	216.5	103.5	44.0	23.0	7.020	1.05	2.25	1.15	98.0	2.5	0	0	0	0	0
117	17	5	62.5	214.0	111.0	43.5	20.9	7.620	1.20	7.00	0.00	97.5	2.0	0	0	0	0	0
118	17	6	65.0	198.5	86.0	42.5	21.0	5.885	0.00	1.20	0.00	95.5	2.5	0	0	0	0	0
119	17	7	63.5	194.0	86.0	43.0	21.7	5.930	0.00	0.00	0.00	89.5	2.5	0	0	0	0	0
120	18	1	62.5	198.5	100.0	42.5	25.0	8.675	9.20	21.60	0.00	104.0	2.0	0	0	0	0	0

ZACAPA 1990 (CONTINUATION)

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
121	18	2	64.0	232.0	123.0	38.0	19.4	6.430	6.90	3.00	0.00	88.0	3.0	0	0	0	0	0
122	18	3	66.0	233.0	120.0	26.0	19.6	4.810	5.30	4.80	0.00	90.0	5.0	0	0	0	0	0
123	18	4	64.0	221.0	115.0	43.5	21.9	8.505	1.15	19.50	1.15	96.5	2.5	0	0	0	0	0
124	18	5	62.5	211.0	112.5	43.5	22.5	8.320	0.00	29.85	2.25	95.0	2.0	0	0	0	0	0
125	18	6	62.0	205.0	107.5	43.5	26.5	8.900	0.00	29.85	0.00	106.0	2.0	0	0	0	0	0
126	18	7	59.5	197.5	95.0	37.0	22.8	7.570	8.40	2.80	0.00	101.0	3.0	0	0	0	0	0
127	19	1	62.0	220.0	115.0	42.5	23.6	8.015	10.00	9.45	2.35	94.0	3.0	0	0	0	0	0
128	19	2	59.5	215.0	117.5	41.5	21.7	8.160	2.40	17.95	0.00	101.5	2.0	0	0	0	0	0
129	19	3	63.0	215.0	115.0	44.0	21.7	7.585	2.55	12.50	1.15	90.0	3.0	0	0	0	0	0
130	19	4	64.5	225.0	115.0	43.5	22.5	7.560	1.30	24.30	0.00	90.5	2.5	0	0	0	0	0
131	19	5	61.5	222.5	120.0	41.0	21.9	7.075	7.65	19.00	2.45	83.5	3.0	0	0	0	0	0
132	19	6	62.0	212.5	107.5	40.5	23.0	8.025	1.10	34.70	1.35	111.0	2.0	0	0	0	0	0
133	19	7	61.5	216.5	107.5	42.0	21.8	8.355	2.50	12.40	2.25	95.5	2.5	0	0	0	0	0
134	20	1	60.5	215.5	103.0	43.5	22.0	7.915	3.65	0.00	0.00	94.0	2.0	0	0	0	0	0
135	20	2	60.0	214.5	106.5	43.5	22.4	7.120	2.45	0.00	1.15	95.5	2.5	0	0	0	0	0
136	20	3	62.0	207.5	106.5	40.5	23.7	7.050	1.35	0.00	0.00	91.5	3.0	0	0	0	0	0
137	20	4	63.5	179.5	100.5	44.0	21.6	7.285	3.40	7.95	0.00	99.0	2.0	0	0	0	0	0
138	20	5	62.0	211.0	101.5	43.5	20.6	6.795	1.25	3.40	0.00	94.5	2.5	0	0	0	0	0
139	20	6	62.0	207.5	102.0	44.0	22.7	7.850	3.55	3.40	1.15	97.5	2.0	0	0	0	0	0
140	20	7	61.0	204.0	97.0	44.0	23.0	7.860	0.00	0.00	0.00	103.5	2.0	0	0	0	0	0
141	21	1	66.0	191.5	96.0	33.5	22.9	4.535	3.20	0.00	0.00	96.5	3.5	0	0	0	0	0
142	21	2	65.0	242.0	128.0	36.0	19.1	6.050	3.60	3.20	0.00	90.0	4.0	0	0	0	0	0
143	21	3	62.5	192.5	95.0	41.0	26.0	7.055	5.80	0.00	0.00	104.0	2.0	0	0	0	0	0
144	21	4	63.5	196.5	98.5	42.5	22.4	7.165	0.00	12.00	0.00	91.5	2.5	0	0	0	0	0
145	21	5	63.0	203.5	104.0	43.0	23.1	7.685	5.65	2.35	0.00	104.5	2.0	0	0	0	0	0
146	21	6	62.5	191.5	90.5	35.5	24.1	5.975	4.50	1.35	1.45	94.5	3.0	0	0	0	0	0
147	21	7	61.5	203.5	94.5	33.5	24.2	6.470	4.45	10.25	0.00	103.0	3.0	0	0	0	0	0
148	22	1	63.5	210.5	106.0	37.0	24.9	6.985	5.60	0.00	1.45	98.0	3.0	0	0	0	0	0
149	22	2	60.5	215.0	110.0	38.0	22.8	7.530	2.95	2.50	0.00	97.0	3.0	0	0	0	0	0
150	22	3	61.5	201.5	102.0	40.5	22.2	6.880	2.65	0.00	0.00	93.5	3.0	0	0	0	0	0
151	22	4	66.0	197.5	96.0	29.0	24.3	5.650	4.00	8.55	1.85	104.5	3.5	0	0	0	0	0
152	22	5	65.0	243.0	131.0	29.0	19.4	5.580	4.20	4.20	0.00	100.0	4.0	0	0	0	0	0
153	22	6	64.5	186.5	87.5	38.5	22.4	4.955	1.60	26.10	0.00	93.0	2.5	0	0	0	0	0
154	22	7	65.5	151.5	71.5	22.5	22.1	2.235	12.50	5.55	0.00	97.0	5.0	0	0	0	0	0
155	23	1	65.0	195.5	81.0	36.0	25.7	5.710	3.05	5.00	0.00	92.0	3.0	0	0	0	0	0
156	23	2	61.5	207.5	101.0	43.0	24.3	8.185	3.40	0.00	0.00	102.5	2.0	0	0	0	0	0
157	23	3	62.0	219.5	110.5	25.0	24.5	5.075	4.40	1.60	0.00	97.5	4.5	0	0	0	0	0
158	23	4	65.5	213.5	111.0	41.5	26.2	6.940	4.55	8.45	1.20	91.0	2.5	0	0	0	0	0
159	23	5	67.0	211.0	100.0	26.5	27.9	4.440	3.50	5.85	0.00	112.0	3.5	0	0	0	0	0
160	23	6	64.0	213.0	106.0	38.0	19.6	6.020	7.10	3.10	0.00	88.0	4.0	0	0	0	0	0
161	23	7	70.0	230.0	115.0	41.5	24.4	6.075	6.20	23.45	0.00	88.5	2.5	0	0	0	0	0

MEANS ACROSS SEVEN ENVIRONMENTS

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
1	1	1	65.9	227.1	120.9	30.8	20.9	4.646	8.88	0.79	7.16	87.7	17.7	4.73	1.8	5.48	1.8	0.7
2	1	2	64.9	230.9	122.9	37.6	20.5	5.754	1.63	2.29	0.95	95.4	12.3	4.64	1.9	2.54	1.7	0.7
3	1	3	67.9	240.1	127.2	36.3	21.5	5.965	1.15	2.46	0.34	89.6	14.6	2.44	1.9	4.22	1.5	1.2
4	1	4	66.5	238.2	128.0	39.6	21.4	6.745	4.14	2.59	0.16	97.9	15.3	3.77	1.9	3.56	1.6	0.7
5	1	5	65.2	240.0	134.4	39.3	20.1	6.750	1.97	8.77	0.16	95.1	10.1	3.28	1.9	3.79	1.7	0.8
6	1	6	65.9	231.9	122.5	38.7	21.1	6.615	1.70	0.81	0.71	100.5	15.9	5.87	1.9	2.93	1.5	0.8
7	1	7	65.5	233.1	127.4	39.2	21.1	6.319	1.34	2.72	0.16	100.9	18.9	3.79	1.6	5.36	1.7	0.7
8	2	1	63.4	232.4	118.6	36.5	20.3	5.584	10.69	3.42	0.37	90.2	15.7	2.81	1.7	4.76	1.7	0.9
9	2	2	62.7	231.0	121.1	35.5	20.1	5.676	6.66	3.21	1.29	95.2	15.9	2.71	1.8	2.16	1.4	0.7
10	2	3	63.6	233.2	118.6	36.1	20.2	5.889	11.64	1.34	0.40	96.2	15.6	2.44	1.8	2.04	1.4	0.7
11	2	4	64.6	231.1	121.5	37.6	20.4	5.827	8.92	3.66	0.93	93.1	12.8	3.61	2.1	2.83	1.6	0.7
12	2	5	64.0	238.0	126.3	33.9	19.8	5.521	9.65	9.96	1.71	96.5	15.9	3.88	1.9	2.70	1.5	0.8
13	2	6	62.4	225.5	111.0	35.6	20.0	5.656	6.56	2.88	1.14	98.5	10.9	5.50	1.9	3.55	1.6	0.9
14	2	7	62.1	225.9	113.2	35.3	21.2	5.163	7.73	0.19	0.74	94.0	10.1	6.40	1.8	2.07	1.6	0.8
15	3	1	63.6	232.9	124.3	35.7	19.3	5.744	7.68	7.48	0.49	96.5	15.9	4.69	1.8	3.31	1.4	1.1
16	3	2	62.8	229.5	121.1	38.4	19.3	6.142	7.31	9.85	1.42	93.9	13.9	4.12	1.7	2.89	1.6	0.9
17	3	3	64.0	233.2	124.3	39.6	20.2	6.369	8.16	5.26	0.67	87.4	14.8	1.86	1.8	3.41	1.5	0.9
18	3	4	64.4	226.6	125.0	39.1	20.3	6.556	5.85	8.43	0.89	97.5	11.1	1.90	1.8	3.16	1.6	0.9
19	3	5	64.6	231.1	131.1	39.2	19.2	6.091	4.41	7.55	1.36	90.2	14.9	3.36	1.9	3.57	1.6	1.1
20	3	6	62.4	217.4	115.0	38.7	19.4	6.431	3.69	10.88	1.05	95.4	12.8	4.31	2.2	3.31	1.5	0.7
21	3	7	63.4	219.6	113.9	37.5	19.7	5.796	3.80	1.87	1.24	95.0	16.6	6.06	1.9	2.81	1.5	0.7
22	4	1	66.4	242.5	127.5	38.6	19.9	6.311	4.79	2.32	0.33	91.0	19.6	5.29	1.9	5.83	1.8	0.7
23	4	2	65.0	240.0	121.4	38.8	19.7	6.359	5.47	6.07	0.34	96.4	16.9	3.60	1.8	2.48	1.6	0.7
24	4	3	65.9	232.1	119.1	24.6	19.7	3.593	6.02	4.00	0.75	94.9	16.6	4.14	2.0	5.63	1.8	0.7
25	4	4	66.7	238.9	125.7	39.4	20.5	6.856	3.79	5.47	0.34	90.0	16.8	4.37	1.9	5.68	1.8	0.9
26	4	5	65.2	242.9	128.9	39.7	19.1	7.277	3.66	5.66	0.51	93.1	16.7	3.44	1.9	2.92	1.6	0.9
27	4	6	66.0	230.4	121.8	38.1	20.0	6.603	4.41	4.21	1.21	97.0	15.2	4.86	1.9	4.26	1.9	0.8
28	4	7	65.6	232.9	121.8	32.0	19.7	5.236	4.50	1.96	0.89	98.1	20.5	3.24	1.6	5.36	1.6	0.8
29	5	1	64.6	227.7	114.3	38.9	20.1	6.214	5.82	2.56	0.33	91.0	12.8	4.88	2.1	5.87	1.8	0.6
30	5	2	63.2	227.0	114.6	38.8	20.3	6.396	2.92	1.07	0.33	96.5	13.8	3.51	1.9	3.03	1.6	1.1
31	5	3	64.4	223.4	113.9	37.9	20.4	5.972	4.11	0.64	1.01	95.9	9.5	4.19	1.9	4.44	1.6	0.9
32	5	4	65.0	225.6	117.5	38.9	19.8	6.452	5.94	2.90	0.34	96.4	13.2	3.82	2.0	4.06	1.6	0.7
33	5	5	64.0	225.0	116.6	38.0	20.1	6.060	3.26	4.29	0.40	93.6	15.1	3.66	1.9	4.12	1.7	0.9
34	5	6	63.8	216.9	111.5	39.1	20.4	6.526	2.39	6.24	0.16	101.1	9.4	4.61	2.1	3.29	1.7	0.9
35	5	7	64.3	224.1	111.6	39.3	20.0	6.059	2.57	3.29	0.00	95.0	12.4	3.72	1.6	3.74	1.7	0.8
36	6	1	61.9	238.7	126.8	38.9	18.9	6.333	7.06	3.70	0.16	95.6	15.0	2.34	1.7	1.00	1.4	0.9
37	6	2	61.1	233.6	125.4	37.5	19.0	5.876	5.41	5.84	2.47	96.4	12.8	3.64	1.8	1.04	1.5	0.9
38	6	3	62.0	228.6	124.6	38.8	19.6	5.975	7.74	2.94	0.32	87.3	14.3	2.66	1.7	1.65	1.5	0.9
39	6	4	62.6	236.1	126.4	38.6	19.6	6.263	4.94	7.51	0.33	93.5	13.9	2.79	1.8	1.14	1.5	0.9
40	6	5	62.6	237.6	128.6	37.9	19.2	6.461	6.34	9.46	0.69	92.3	13.4	2.24	1.8	1.54	1.5	1.0

MEANS ACROSS SEVEN ENVIRONMENTS
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
41	6	6	60.5	226.6	122.9	39.2	18.9	6.660	2.98	5.77	1.19	103.1	10.8	3.04	1.8	1.46	1.4	0.8
42	6	7	61.0	227.1	119.3	38.0	19.4	5.976	4.53	3.26	1.15	94.6	14.6	4.74	1.8	1.48	1.6	0.9
43	7	1	63.1	227.6	122.4	39.8	18.9	5.472	4.87	1.85	1.17	91.4	17.9	2.57	2.2	9.41	2.2	0.7
44	7	2	62.4	226.4	120.3	39.6	19.3	5.594	3.81	8.07	1.34	94.4	16.9	3.09	2.3	8.97	2.3	1.0
45	7	3	63.8	226.6	116.6	39.9	20.0	5.622	3.48	3.61	0.16	94.7	14.7	4.01	2.3	9.40	2.1	0.8
46	7	4	64.1	225.5	117.6	39.6	20.0	5.579	4.30	1.96	1.38	92.1	15.4	4.14	2.1	9.89	2.4	0.8
47	7	5	64.3	226.8	123.6	39.2	18.8	5.306	5.74	5.12	1.86	93.5	17.7	4.38	2.5	9.79	2.5	1.2
48	7	6	63.3	220.7	118.1	39.3	19.1	5.539	2.20	5.44	1.19	95.5	14.1	2.79	2.1	9.01	2.2	0.9
49	7	7	62.8	221.8	116.7	39.4	19.5	5.275	3.96	4.79	0.69	97.9	19.9	3.80	2.1	8.84	2.3	0.9
50	8	1	63.4	225.4	116.1	37.8	19.1	6.138	4.39	1.61	0.86	97.2	13.4	1.85	1.9	1.79	1.7	0.7
51	8	2	62.6	228.9	118.2	39.0	18.4	6.106	5.60	3.81	0.84	91.4	16.4	2.78	1.9	1.50	1.5	0.8
52	8	3	63.9	224.3	118.2	39.4	19.4	6.126	5.90	1.78	0.16	93.5	14.8	2.40	2.0	2.44	1.5	0.8
53	8	4	64.1	231.1	121.4	38.9	19.6	6.439	4.43	1.29	0.36	94.0	13.6	3.99	2.1	2.11	1.6	0.8
54	8	5	63.8	231.2	124.8	39.1	18.9	6.165	2.89	2.84	0.38	92.9	9.4	2.19	2.1	2.11	1.8	0.7
55	8	6	63.3	220.0	112.5	37.9	20.2	6.222	2.89	3.44	0.71	104.5	10.4	4.56	2.0	1.70	1.7	0.9
56	8	7	62.6	218.9	117.1	38.3	19.5	5.915	2.72	3.27	0.39	97.4	16.8	5.02	2.0	1.62	1.8	0.7
57	9	1	65.6	244.0	128.1	38.4	19.1	5.538	4.69	5.71	2.20	87.8	18.0	3.04	2.3	7.79	2.0	0.8
58	9	2	64.5	243.6	135.0	38.5	19.1	5.680	3.83	2.73	1.20	93.2	19.6	3.45	2.2	8.65	2.1	0.9
59	9	3	66.9	240.7	130.1	38.4	19.7	5.198	7.62	2.58	0.33	79.6	18.5	3.31	2.0	10.94	1.9	0.8
60	9	4	66.4	239.6	132.0	39.9	20.2	5.622	2.62	7.41	0.66	89.4	17.9	3.76	2.0	10.86	2.1	0.7
61	9	5	64.7	241.8	134.4	39.9	19.6	6.743	4.04	5.51	1.68	97.1	8.4	2.48	1.9	9.42	1.9	0.9
62	9	6	65.6	236.3	127.7	39.5	19.9	5.844	2.27	17.55	1.34	92.3	15.9	5.41	2.0	9.58	1.9	0.8
63	9	7	65.6	231.8	125.4	36.3	19.8	5.214	3.78	5.29	0.32	95.6	19.1	2.40	2.1	4.64	2.0	0.9
64	10	1	63.1	237.5	125.7	39.9	19.7	6.426	2.94	1.84	0.49	95.4	10.0	2.01	2.1	6.98	1.9	0.6
65	10	2	61.9	243.9	124.6	39.1	19.2	6.554	2.55	4.65	0.53	92.4	13.4	1.44	1.9	3.09	1.7	0.8
66	10	3	62.8	244.6	128.9	39.4	19.8	6.636	3.65	1.02	0.38	95.4	8.2	1.54	2.1	4.23	1.7	0.7
67	10	4	64.1	243.9	125.4	39.6	19.4	6.694	1.76	4.58	0.00	96.6	5.4	1.23	1.9	5.69	1.6	0.8
68	10	5	64.2	252.9	135.7	39.0	19.1	6.679	2.96	5.44	0.93	98.1	9.7	1.61	1.9	3.86	1.7	0.8
69	10	6	62.7	234.6	117.5	39.5	19.6	6.640	4.09	2.99	0.81	95.0	10.3	3.14	2.2	5.09	2.0	0.8
70	10	7	62.6	230.6	118.6	38.3	19.7	6.259	2.73	1.66	0.00	95.0	9.9	4.22	1.9	7.01	2.1	0.6
71	11	1	63.7	237.6	128.6	38.6	19.5	5.777	3.96	1.48	0.00	91.1	12.9	4.05	1.8	5.84	2.0	0.7
72	11	2	62.0	237.7	125.4	38.6	19.6	6.515	5.34	3.18	0.33	95.2	6.7	2.33	2.0	5.43	1.9	0.8
73	11	3	63.6	236.1	121.8	38.7	20.0	6.004	7.29	1.34	0.32	89.6	10.2	3.96	1.9	6.09	1.8	0.7
74	11	4	64.1	231.6	124.7	39.5	19.5	6.497	6.11	3.63	0.68	98.4	6.9	2.76	2.0	7.38	1.8	0.9
75	11	5	63.6	249.0	138.1	39.5	19.2	6.746	3.01	3.45	0.54	96.5	9.9	2.24	1.9	5.75	1.9	0.7
76	11	6	62.6	233.6	122.8	38.4	19.5	6.149	3.61	3.45	0.80	96.9	7.2	5.46	1.9	6.31	1.8	0.8
77	11	7	63.0	229.6	123.1	38.3	19.5	6.702	5.84	1.47	0.53	95.6	12.6	3.66	2.0	6.86	2.0	0.7
78	12	1	62.7	235.8	125.4	39.5	20.1	6.224	5.23	1.83	0.35	93.3	14.6	2.93	1.9	6.99	1.8	0.6
79	12	2	62.6	234.6	125.3	39.6	18.9	6.376	5.25	4.08	1.24	93.3	11.9	1.68	1.9	8.97	2.0	0.7
80	12	3	63.4	237.9	127.9	39.9	19.9	6.162	4.35	2.17	0.51	88.6	9.7	2.51	2.0	7.09	1.8	0.7

MEANS ACROSS SEVEN ENVIRONMENTS

ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
81	12	4	64.6	237.6	122.1	23.1	19.3	4.104	7.61	1.10	0.42	104.6	11.9	3.69	1.9	7.38	2.1	0.8
82	12	5	62.8	246.4	135.8	40.5	18.9	6.966	3.58	4.12	0.17	96.4	9.3	3.29	1.9	0.51	1.6	0.7
83	12	6	63.0	223.8	114.3	39.2	19.4	6.171	2.77	5.28	0.16	94.2	6.5	3.65	2.0	9.74	1.9	0.6
84	12	7	62.6	235.9	125.6	39.1	19.4	6.527	3.04	1.50	0.00	95.4	10.4	3.94	2.0	8.83	1.9	0.6
85	13	1	63.5	231.1	127.4	38.9	20.1	7.100	6.34	0.66	0.00	93.2	10.9	2.36	1.9	0.66	1.3	0.9
86	13	2	62.9	231.4	128.2	32.9	20.2	5.931	4.78	1.87	0.74	102.7	12.5	3.59	1.7	1.56	1.4	0.7
87	13	3	65.3	223.8	117.6	22.6	19.9	3.648	3.81	2.74	0.18	99.6	15.1	3.11	1.9	7.07	2.1	0.6
88	13	4	64.1	228.6	127.9	38.5	20.9	7.106	4.39	3.73	0.81	103.6	11.0	3.26	1.7	0.81	1.4	0.7
89	13	5	63.4	235.4	132.5	38.9	20.1	7.383	3.39	3.98	0.41	97.2	11.4	2.33	1.7	0.67	1.2	0.9
90	13	6	63.1	221.3	118.2	37.8	20.6	7.205	4.13	1.79	0.24	101.9	14.7	3.26	1.6	0.66	1.4	0.7
91	13	7	63.1	224.3	122.9	38.6	20.5	6.943	3.31	2.16	0.00	100.6	10.4	4.99	1.9	0.49	1.4	0.8
92	14	1	63.3	223.9	122.5	39.4	20.1	6.908	5.49	1.34	0.00	96.4	9.6	3.08	1.9	0.82	1.4	0.6
93	14	2	63.7	222.3	122.5	38.4	20.5	6.632	3.58	3.87	0.18	99.4	11.6	2.62	1.7	1.22	1.3	0.7
94	14	3	63.4	223.4	120.7	39.7	20.2	6.694	5.07	0.34	0.19	96.3	10.9	1.77	1.8	1.14	1.4	0.9
95	14	4	63.5	231.6	125.7	38.9	20.4	7.319	4.94	2.61	0.61	101.9	9.1	2.34	1.9	0.82	1.4	0.8
96	14	5	63.6	234.3	130.0	40.3	20.6	7.082	2.39	9.88	1.19	95.9	8.5	2.50	1.8	0.84	1.5	0.7
97	14	6	63.0	219.6	116.4	37.7	19.9	6.605	4.74	3.10	0.16	98.4	8.3	3.13	1.7	1.46	1.3	0.8
98	14	7	63.1	215.4	114.3	38.4	20.8	6.284	5.06	0.70	0.17	96.9	11.1	2.84	1.7	1.09	1.3	0.8
99	15	1	64.2	235.4	124.6	38.6	19.5	6.017	3.84	1.75	1.25	93.6	10.8	2.01	2.1	10.39	2.0	0.7
100	15	2	62.1	243.2	130.4	38.0	19.3	6.455	2.13	3.72	1.16	96.3	9.5	2.10	2.0	8.99	1.8	0.7
101	15	3	63.5	240.5	128.2	37.4	19.9	5.928	3.88	3.81	0.86	90.0	9.4	1.53	2.1	9.19	1.9	0.7
102	15	4	64.2	243.2	127.1	39.4	20.0	6.783	0.88	4.94	0.99	95.9	9.1	2.54	2.0	9.41	1.9	0.9
103	15	5	63.9	250.7	137.9	38.8	19.7	6.917	1.59	3.23	0.59	99.4	8.0	1.60	2.1	9.86	1.9	0.7
104	15	6	62.6	236.9	123.2	37.4	19.6	6.716	1.71	3.55	0.56	102.7	5.2	2.29	2.1	9.09	2.0	0.9
105	15	7	63.6	238.9	126.1	38.6	19.2	6.227	2.93	5.69	0.36	92.9	9.3	4.16	2.0	9.89	2.0	0.6
106	16	1	64.0	229.3	116.8	39.9	19.2	5.996	7.98	1.79	0.32	91.1	13.7	3.20	2.0	1.99	1.7	1.1
107	16	2	63.2	227.6	122.5	39.1	18.5	5.959	4.86	0.38	3.46	97.1	18.5	4.97	1.9	6.35	2.0	1.1
108	16	3	63.4	228.9	125.0	39.6	19.5	6.404	9.35	0.68	0.16	92.9	12.4	1.89	2.2	2.16	1.8	1.1
109	16	4	64.5	229.6	116.1	38.9	19.6	6.339	7.01	2.32	0.00	95.0	15.3	2.50	1.8	2.19	1.8	1.0
110	16	5	63.9	236.4	126.4	38.2	19.5	6.503	3.40	2.94	0.00	94.8	14.1	4.04	1.9	3.41	1.8	1.1
111	16	6	62.4	223.9	115.9	39.7	19.6	6.525	1.45	3.75	0.84	98.1	14.4	1.42	1.9	1.79	1.9	1.1
112	16	7	63.9	217.9	108.9	38.9	18.7	5.022	6.25	0.34	0.00	95.9	22.1	4.02	2.0	2.66	1.9	0.9
113	17	1	63.6	228.4	115.5	38.3	18.9	5.583	6.37	0.56	1.25	90.4	13.1	3.69	1.9	3.73	1.7	0.9
114	17	2	63.3	231.3	122.4	39.2	19.3	5.708	3.72	1.33	0.67	93.3	17.4	3.43	2.0	3.41	1.8	0.9
115	17	3	64.4	225.6	118.8	38.5	20.0	6.089	4.51	1.64	0.34	90.4	12.1	2.43	1.9	2.65	1.7	0.8
116	17	4	65.3	235.9	118.4	38.6	20.0	6.007	2.79	4.34	0.33	92.0	12.9	3.12	1.6	2.33	1.6	0.7
117	17	5	63.6	239.1	129.8	38.4	19.1	6.018	2.51	2.04	0.35	89.9	15.1	3.49	1.9	6.30	1.8	0.9
118	17	6	64.0	224.8	110.1	37.7	19.6	6.003	2.18	3.15	0.34	93.7	12.6	4.26	1.8	1.86	1.5	0.8
119	17	7	64.6	218.1	111.9	36.1	20.3	4.493	5.40	0.42	0.60	89.3	24.5	5.04	1.6	2.51	1.8	0.6
120	18	1	64.9	227.3	126.8	39.4	20.3	6.168	8.60	7.42	1.02	91.3	12.9	3.34	2.2	10.36	2.2	0.7

MEANS ACROSS SEVEN ENVIRONMENTS
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ENTRY	WHOLE	SPLIT	SILK days	PLTH cm	EARH cm	STAND plot	HUM %	YIELD t/ha	HUSK %	RLODG %	SLODG %	PROLIF %	EROT %	VIR %	HELM 1-10	PPHELM %	RUST 1-10	CURV 1-10
121	18	2	63.9	231.7	123.3	33.9	19.3	5.064	4.99	4.92	1.09	88.9	14.1	2.71	2.1	8.86	2.1	0.9
122	18	3	66.1	233.3	120.0	21.3	19.6	3.440	6.39	3.44	0.00	101.6	16.0	1.69	1.9	9.13	2.1	0.6
123	18	4	65.7	233.7	124.3	38.4	20.5	6.206	2.74	8.84	0.33	93.6	12.6	3.06	2.3	10.54	2.3	1.0
124	18	5	64.6	239.8	133.9	39.6	20.0	6.649	1.15	10.06	1.66	97.9	10.6	1.36	2.4	8.25	2.2	1.1
125	18	6	64.1	226.1	120.7	38.9	20.5	6.502	0.54	13.10	0.86	96.2	10.6	4.54	2.4	13.31	2.1	0.9
126	18	7	64.7	221.1	112.9	29.0	20.1	4.912	5.69	2.22	0.00	102.5	12.1	3.04	2.0	7.91	2.0	0.6
127	19	1	63.3	230.4	120.0	39.1	20.0	6.138	7.54	3.74	1.36	86.1	17.6	2.81	2.1	5.51	1.8	0.9
128	19	2	62.6	231.8	128.6	38.4	19.6	6.159	5.95	8.48	0.34	94.1	15.1	2.56	2.0	4.22	1.8	1.0
129	19	3	64.3	234.3	127.9	39.1	19.8	6.089	4.12	6.40	0.33	87.1	14.0	4.10	2.1	6.51	1.6	1.2
130	19	4	64.7	242.1	132.9	39.9	20.2	6.561	3.19	8.77	0.00	94.0	13.1	2.04	1.9	6.33	1.9	0.8
131	19	5	63.9	237.1	129.6	38.1	19.6	5.854	3.19	5.87	1.04	89.9	15.2	3.69	2.1	3.79	1.8	1.3
132	19	6	63.2	225.4	117.5	38.9	20.1	6.451	4.19	7.65	1.64	97.9	10.9	3.80	1.9	4.55	1.8	0.9
133	19	7	62.4	224.9	117.5	39.0	19.3	6.283	3.97	3.16	1.31	95.8	23.1	2.41	1.9	4.24	1.6	0.9
134	20	1	64.3	229.0	120.8	39.9	20.1	6.252	2.76	2.70	0.67	89.6	11.1	2.52	2.1	6.17	1.7	0.7
135	20	2	63.3	228.9	120.2	39.4	19.9	5.919	3.80	2.95	0.69	87.3	15.1	2.36	2.1	4.22	1.6	1.0
136	20	3	64.4	228.2	124.1	37.2	20.1	5.466	4.15	1.49	0.36	88.4	11.2	4.76	2.3	6.64	1.6	0.9
137	20	4	65.1	226.0	119.7	39.1	20.2	6.405	1.72	3.95	1.09	92.1	10.6	3.61	1.9	6.01	1.6	0.7
138	20	5	63.6	228.4	120.6	39.4	18.9	6.413	2.19	1.89	1.86	92.3	7.7	1.38	2.1	5.69	1.7	0.9
139	20	6	63.7	223.9	116.0	39.3	19.9	6.399	3.01	5.44	0.34	92.6	8.9	2.10	2.3	7.16	1.9	0.9
140	20	7	63.9	223.4	116.7	39.0	19.7	6.278	0.76	0.16	1.09	89.8	8.7	1.86	1.9	5.60	1.5	0.9
141	21	1	65.4	226.3	116.9	36.7	18.9	4.942	2.66	2.14	0.52	91.8	15.3	3.94	2.1	6.16	2.0	1.0
142	21	2	65.1	241.7	127.9	31.5	19.0	4.684	4.24	5.12	0.19	92.9	13.9	3.03	1.9	5.15	1.9	0.7
143	21	3	63.9	234.3	121.1	37.3	20.1	6.149	6.91	1.21	0.00	95.9	11.0	1.27	1.9	4.94	1.8	0.7
144	21	4	64.5	230.9	119.1	39.4	19.8	6.418	3.27	4.72	0.00	100.1	12.5	3.67	1.9	4.71	1.9	0.6
145	21	5	64.1	235.5	127.0	38.1	19.1	6.509	3.59	3.49	0.19	99.5	11.4	1.59	2.0	5.71	1.7	0.8
146	21	6	64.0	229.5	120.8	34.9	20.0	5.971	3.52	1.24	0.21	103.6	8.6	3.00	1.9	6.04	1.8	0.7
147	21	7	63.9	226.9	114.2	32.4	19.3	5.236	3.86	1.66	1.44	103.1	15.4	3.66	1.9	6.73	1.9	0.7
148	22	1	65.2	228.3	119.8	34.0	19.4	5.865	2.84	0.70	0.39	92.4	18.0	3.69	2.0	5.24	1.8	0.7
149	22	2	62.4	237.9	126.1	38.6	19.2	6.897	1.85	1.69	0.16	100.7	14.2	2.74	1.9	2.84	1.8	0.8
150	22	3	64.1	228.4	118.5	35.9	19.9	5.939	1.94	1.66	0.50	96.2	10.6	2.83	1.9	4.61	1.6	0.8
151	22	4	66.4	226.4	115.9	34.6	20.8	5.349	3.79	1.77	0.71	95.1	16.6	5.19	2.1	4.95	1.9	0.9
152	22	5	65.2	243.3	131.2	24.6	19.4	4.499	1.93	5.20	0.21	103.1	9.2	3.31	1.9	7.26	1.9	1.1
153	22	6	63.9	220.9	111.1	37.8	19.1	5.716	1.81	9.61	1.71	96.9	11.7	4.57	2.0	4.23	2.0	0.8
154	22	7	65.9	183.8	91.3	28.1	18.1	2.514	4.16	1.76	0.40	86.3	38.2	5.63	2.4	7.99	2.5	0.8
155	23	1	65.6	230.1	113.4	34.4	20.4	5.258	2.61	3.34	0.74	90.1	13.4	3.71	1.9	4.81	1.9	0.9
156	23	2	63.8	228.6	117.3	38.2	20.5	6.354	3.98	2.54	0.54	95.3	9.9	2.49	1.8	4.97	1.9	0.7
157	23	3	64.2	232.4	122.9	31.7	20.0	5.153	3.66	0.94	0.23	99.6	13.4	2.46	2.2	6.02	1.9	1.0
158	23	4	66.4	226.6	119.1	37.4	20.4	5.789	3.97	2.30	0.93	92.1	12.6	4.76	1.7	4.92	1.9	0.9
159	23	5	66.8	240.1	123.9	34.3	21.1	5.388	3.71	6.64	0.36	96.3	17.4	3.76	1.9	3.86	1.6	0.8
160	23	6	63.9	212.6	106.2	33.1	19.5	4.651	7.00	3.07	0.82	89.6	15.6	4.92	2.1	6.26	2.3	0.7
161	23	7	68.2	249.3	134.3	37.9	21.1	6.234	5.57	7.03	0.20	98.1	15.6	2.32	1.8	0.98	1.5	0.9